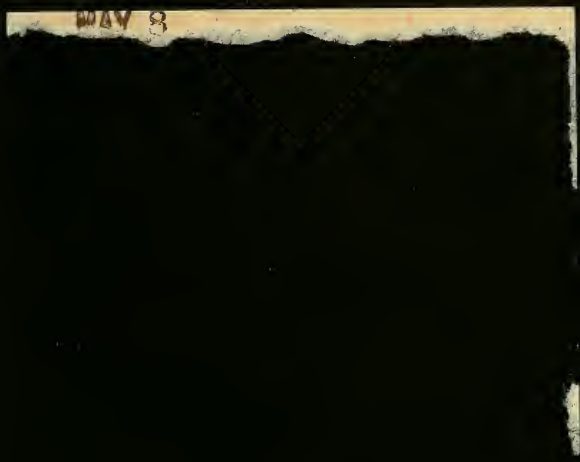
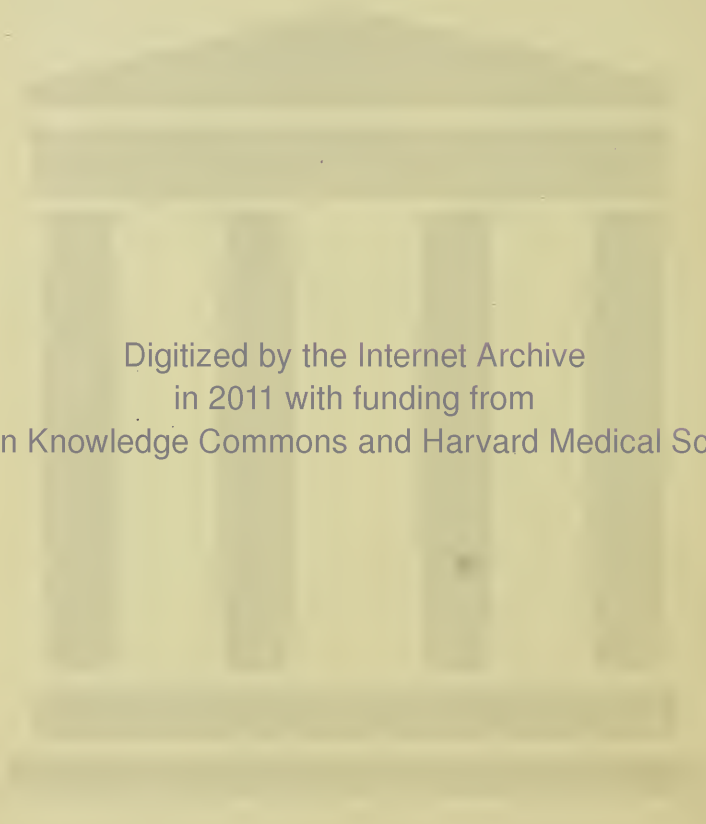
HARBEN LECTURES 1898

RICHARD THORNE THORNE





THE ADMINISTRATIVE CONTROL

OF

TUBERCULOSIS:

BEING

THE HARBEN LECTURES

DELIVERED IN 1898 BEFORE

The Royal Institute of Public Health.

BY

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THE ADMINISTRATIVE CONTROL

OF

TUBERCULOSIS.

LECTURE I.

I DESIRE in the course of these lectures to consider how far it is practicable to control and prevent tuberculosis in the human subject by means of administrative measures. With that which merely happens to fall within the range of possibility, but which is obviously not within the range of practice, I do not intend to concern myself at any length. I may, however, at times find it necessary incidentally to refer to measures which, though excellent in theory, must, in my opinion, be set aside as incapable of application.

As a preliminary to the discussion of this subject, it becomes necessary to ascertain, as far as we can, what is the extent and character of the evil that has to be contended with; and this inquiry leads us, in the first instance, to consider how far this point may be elucidated by the aid of vital statistics. Hitherto, the statistical aspect of the question has been very involved and obscure, but the data supplied by Dr. Tatham to the Royal Commission on Tuberculosis, 1896, have made this part of my task distinctly easier, and I do not hesitate to make considerable use both of his evidence and of the tables which he submitted to that Commission.

It is well known that before 1874 the medical certification of

causes of death was optional, and that for a long period antecedent to and for some time subsequent to that date, even those deaths which were classed as certified can by no means be so regarded from the medical point of view. It is also matter of notoriety that a number of deaths now referred to tuberculosis were formerly not so referred; whereas, on the other hand, many deaths formerly certified as due to one or other form of tuberculosis are now differently classified. Owing to these causes it is not possible to make any exact comparison between the rates of death from tuberculosis as a whole, and from the different forms of tuberculosis, at different periods of time since the passing of the Act for the Civil Registration of Deaths in 1837, or even since 1847, when, for the first time, the causes of death in combination with ages were abstracted in the General Register Office of England and Wales. But it is a matter of satisfaction to have the official assurance of Dr. Tatham to the effect that even for this purpose the available statistics are not without value.

Taking deaths registered from "All Forms of Tubercular Disease," first in the three decennial periods 1851—1860, 1861—1870, and 1871—1880, and then in the three quinquennial periods 1881—1885, 1886—1890, and 1891—1895 in both sexes and at all ages, it will be seen that the rate of death per million living has undergone continuous diminution, and that whereas the rate for 1851—1860 was 3,483, it was for 1891—1895 only 2,122, which exhibits a diminution of 39·1 per cent. And further, when these two groups of years are compared for each separate age-period for which the material is available, it is found that the rate for 1891—1895 invariably exhibits a marked reduction as contrasted with that for 1851—1860. Indeed, with but few exceptions, the reduction shows itself to have been continuous for each period referred to throughout the term of forty-five years in question, as will be seen from the following table:

TABLE A.

England and Wales.—Mortality from All Forms of Tubercular Disease, *in several periods*, 1851—1895.

Period.	Per million living.											
	All ages.	Under 5 years.	5—10.	10—15.	15—20.	20—25.	25—35.	35—45.	45—55.	55—65.	65—75.	Over 75.
1851—1860.. ..	3,483	5,764	1,218	1,359	3,200	4,361	4,463	4,208	3,589	2,986	2,154	929
1861—1870.. ..	3,240	5,445	979	1,094	2,833	4,053	4,333	4,102	3,428	2,767	1,724	617
1871—1880.. ..	2,863	5,209	861	920	2,205	3,221	3,693	3,807	3,197	2,529	1,572	537
1881—1885.. ..	2,540	4,547	874	865	1,923	2,695	3,273	3,413	2,937	2,290	1,441	536
1886—1890.. ..	2,322	4,441	819	798	1,652	2,327	2,829	3,099	2,757	2,244	1,450	605
1891—1895 . ..	2,122	4,155	762	725	1,510	2,081	2,503	2,912	2,563	2,057	1,252	514
Reduction per cent. between 1851—1860 and 1891—1895 ..	39·1	27·9	37·4	46·7	52·8	52·3	43·9	30·8	28·6	31·1	41·9	44·7

This cannot but be matter of satisfaction ; and that satisfaction is enhanced, in so far as purposes of State are concerned, when it is noted that by far the greatest amount of reduction in death from tubercular disease sets in during the period of incipient youth, reaches its maximum in the period of full adolescence when human life is commonly at its highest value to the nation, and that it still obtains throughout the period of adult manhood and womanhood. Although, therefore, it remains true that we are dealing with a group of diseases which is still so fatal as to cause some 60,000 deaths annually in England and Wales, yet it ought not to be forgotten that for a long series of years we have been steadily advancing in the adoption of measures tending to diminish preventable disease, and that, speaking of death from tubercular diseases as a whole, we have no cause to be ashamed of the result achieved. Dealing with such records of the causes of death as are available, Dr. Tatham, speaking before the Royal Commission on Tuberculosis of 1896, with his customary official caution, says : "I think there is no doubt whatever that there has been a steady and substantial reduction from the year 1851 down to the year 1895."

But when we come to examine all the available statistical records in detail, we find that this reduction of tubercular disease

has not been uniform, either as regards its several forms or as regards persons living at different age-periods.

Thus, when we look at the rates of mortality from "Phthisis," we find that in each of the five-year periods up to twenty-five years of age there have been reductions which are distinctly in excess of those affecting the same age-periods from "All Forms of Tubercular Disease"; indeed, it seems clear that much of the reduction referred to under the latter heading has been due to a fall in the phthisis rate. The precise degree of reduction in the rates of death from phthisis in infancy and childhood is doubtful by reason of improved diagnosis and improved certification in the later as contrasted with the earlier periods; but there remains the fact that there has been reduction at every age-period, and also that in the several age-groups included in the age-period 15—45 years, when the mortality from phthisis is still very heavy, the contrast between the rates in 1891—1895 as compared with 1851—1860 shows for the later of the two periods reductions ranging from no less than 32 to 58 per cent.

TABLE B.

England and Wales.—Mortality from PHTHISIS, *in several periods*, 1851—1895.

Period.	Per million living.								
	All ages.	Under 5 years.	5—10.	10—15.	15—20.	20—25.	25—35.	35—45.	45—55.
1851—1860...	2,679	1,305	572	1,025	2,961	4,181	4,317	4,091	3,466
1861—1870...	2,475	968	454	825	2,651	3,928	4,243	4,026	3,340
1871—1880...	2,116	767	358	664	2,036	3,117	3,619	3,745	3,132
1881—1885...	1,830	569	312	560	1,695	2,535	3,154	3,312	2,849
1886—1890...	1,635	502	271	488	1,420	2,144	2,691	2,985	2,656
1891—1895...	1,463	444	228	410	1,253	1,875	2,342	2,771	2,440
Reduction per cent. between 1851—1860 and 1891—1895	45·4	66·0	60·1	60·0	57·7	55·2	45·7	32·3	29·6

So, also, there are phases in the statistical history of fatal "tuberculosis" in England and Wales which, instead of affording

ground for satisfaction, lead us to inquire how it is that amidst the general saving of life from tubercular disease which has been brought about, we have so signally failed to secure its benefits to a large class of the most helpless of the population, namely, infants and young children, who are still claimed in almost undiminished and even increasing numbers as victims of a certain form of disease classified as tubercular.

I refer here more especially to that form of disease which is registered under the name of "Tabes Mesenterica," a term the use of which is mainly limited to disease and death occurring in infancy and childhood. Taking the rate of mortality under this heading per million living at all ages, there has been a diminution from 260 in 1851—1860 to 238 in 1891—1895, namely, one of only 8·5 per cent.

But under 1 year of age the corresponding rates were 3,169 for 1851—1860, and 4,046 for 1891—1895, namely, an increase of no less than 27·7 per cent.; and as regards the period under 5 years, there was only a trivial decrease at the rate of 3·0 per cent. These rates stand in striking contrast with those for "All Forms of Tubercular Disease," and still more so with those from "Phthisis."

TABLE C.

England and Wales.—Mortality from Tabes Mesenterica, *in several periods,* 1851—1895.

Period.	Per million living.	Per million births.	Per million living.
	All ages.	Under 1 year.	Under 5 years.
1851-1860	260	3,169	1,625
1861-1870	295	3,800	1,856
1871-1880	318	4,467	2,028
1881-1885	289	4,356	1,852
1886-1890	265	4,462	1,764
1891-1895	238	4,046	1,577
Reduction or Increase per cent. between 1851-1860 and 1891-1895	− 8·5	+ 27·7	− 3·0

Thus, when we compare the vital statistics as to tuberculosis in this country during the early and the later years of a period which well-nigh covers the last half century, we find as follows :

(1) There has taken place a remarkable reduction in the rate of death from " All Forms of Tubercular Disease," this reduction being most marked during the age-period 10—35 years.

(2) There has been a still more remarkable reduction in the rate of death from " Phthisis," this reduction having been greatest at the several age-periods ranging from infancy up to 35 years.

(3) Notwithstanding the fact that at the earlier periods of life there have been reductions in the rate of mortality from the two groups of tubercular disease referred to, there has, on the contrary, been under one year of age a large increase in the rate of death from " Tabes Mesenterica," and such reduction in the rate of death from this cause as has taken place during the first five years of life has been altogether insignificant.

When, therefore, we come to discuss the question of the administrative measures which may tend to the prevention of tubercular disease in this country, it behoves us to seek some explanation of these conflicting results, which are the outcome of the past, and to ask ourselves the question, Can a reason be assigned for the fact that whilst signal success has been obtained as regards reduction in the death-rate from the two groups of tubercular disease first named, there has been comparative failure, and at one age-period worse than failure, as regards the third form referred to?

No sufficient answer can be given to this question until we have sought to learn, in the first instance, what have been the influences —administrative and other—which have been at work in our midst during the period governed by the statistics quoted, and which at one and another period of life have gone to modify, for better or for worse, the death-rate from one or another form of tuberculosis.

In seeking information as to this it would have been interesting to have differentiated, in so far as causation is concerned, between the three groups of death from tuberculosis to which I have referred,

namely, (1) "All Forms of Tubercular Disease," (2) "Phthisis," and (3) "Tabes Mesenterica."

But I find myself at once confronted with the fact that the diminution which has taken place in the death-rate from "All Forms of Tubercular Disease" is so largely governed by the corresponding but still greater diminution in the death-rate from "Phthisis," that these two groups are practically inseparable from the point of view of causation. Those conditions which have so largely saved life from pulmonary consumption have, it is true, also saved life at certain age-periods from other forms of tubercular disease; but it is difficult to assert the converse and to say that there has been at work any one administrative or other influence which has led to any substantial saving of life from "All Forms of Tubercular Disease," but which has left the death-rate from "Phthisis" untouched. Under these circumstances consideration of the influences which have been at work since 1850 in the reduction of the phthisis death-rate may, for the purposes of these lectures, be regarded as applicable to the corresponding reduction in the death-rate from "All Forms of Tubercular Disease."

What have been these influences? They are so many and so varied that I cannot pretend to discuss or even to refer to them all. The title of my lectures at the outset limits me to administrative measures, but I am none the less sensible of the fact that many social and moral influences which cannot be regarded as coming within the scope of ordinary administration have been at work, and have been potent for good in this direction. Better wages, better food, better housing, better clothing, better regulation of the conditions of labour—these and kindred measures have all gone to make the human subject in this country not only more resistant to the widely-distributed infection of tuberculosis, but more capable of overcoming that infection when it has made some preliminary inroads in the system. Influences such as these I must, however, at once pass by, and I must also curtail any reference to measures which properly come within the purview of public health, for public health concerns itself with well-nigh everything which affects the well-being of man. My limitation

must restrict me to those administrative measures with which the work of the medical officer of health is primarily concerned, and even here I shall be compelled to err rather on the side of excluding some matters which ought to be included than of including others which might perhaps be more properly excluded.

Amongst the influences that have been at work in the past I have no hesitation in assigning a foremost place to those administrative measures which have gone so far to secure for men women, and children, the benefits of free movement of air and free access of sunlight as regards both their dwellings and their places of labour. When we recall the descriptions given between twenty-five and fifty years ago as to the overcrowding of houses on space, and of people within the houses in some of our large towns and cities, and as to the incidental evils, both physical and moral, which always go hand in hand with that obvious breach of Nature's simplest law by which our fellow-subjects are deprived of air and light, and then compare the existing state of affairs in those same cities, we may be proud of the achievements of the past half-century, even though we may deplore that the change has not been so complete as we could have wished.

If it were possible to-day to apply Sir John Simon's description of many portions of the City of London half a century ago in any corresponding sense to portions of this Metropolis, I can well imagine the storm of indignation by which those would be assailed who were responsible for the maintenance of such conditions. Writing in 1849, Sir John described the haunts of infectious disease within the City as marked by complicated turnings, narrow inlets, close parallels of houses, and high barriers preventing light and movement of air. He referred especially to "courts and alleys hemmed in on all sides by higher houses, having no possibility of any current of air, and, worst of all, sometimes so constructed back-to-back as to forbid the advantage of double windows or of back-doors, and thus to render the house as perfectly a cul-de-sac out of the court as the court is a cul-de-sac out of the next thoroughfare." Writing again in 1865 as to Metropolitan tenement houses, he explained that their evils combined to constitute "one monstrous form of nuisance," where

overcrowding reached a proportion that "no obtainable quantity of ventilation" could keep the air of the dwelling free from hurtful contamination, and where the houses, large but densely peopled, were "often without a span of courtyard either front or back," and where, under the baneful effects of the absence of light and air, the influence was so degrading that to children "born under its curse" it must often have been "a very baptism into infamy."

Since that day those portions of the City which called for such unmeasured condemnation, and to a large extent also similar areas in the Metropolis generally and in most of our large towns and cities, have been swept away. Wide thoroughfares carried through the densest districts have brought in light and air, and the dwellings which have replaced the former ones have been provided with open spaces about them which, though often insufficient, have resulted in a complete transformation of the neighbourhoods in which they have been erected. So also, building by-laws have been very extensively adopted throughout England and Wales, which have provided for a minimum amount of open space both to the front and to the rear of domestic buildings, and also for one or more windows on each story opening on to those spaces, so as to insure to the inmates the benefits of the movement of air and of the light thus provided.

There is abundant evidence of the advantages which have thus been brought about; and the well-known investigations of Dr. Tatham in Salford have afforded definite proof of the value of this open space in the reduction of that form of tuberculosis in which the infection is to be thought of as mainly conveyed through the air. Thus, in districts where *all* the houses were built on the vicious system known as "back-to-back," the phthisis death-rate was 5·2 per 1,000 living; where 56 per cent. of the houses were so built the rate was 3·6; where 23 per cent. only were so constructed it was further reduced to 3·3 per cent., and, lastly, where there were no "back-to-back" houses, that is to say, where all houses were provided with some means of light and air both in front and to the rear, the rate was only 2·8. This result is also the more remarkable because, as Dr. Tatham puts it, "with the exception of the means for through-ventilation, the

back-to-back houses as a whole are in a better sanitary state than the through-houses."

Modern research has supplied the explanation of this, for we now know that there are few things more destructive to the bacillus of tuberculosis than exposure to the combined influence of sunlight, or even ordinary daylight, and of movement of air. Such research affords also an incentive to further progress in this matter; but I cannot help calling attention to the fact that the great progress in this country in the reduction of the phthisis death-rate was in full operation before the discovery of the tubercle bacillus and before any action could be based on the knowledge that we have to deal with a living infective organism.

Some experts complain, and rightly so, that the minimum spaces I have referred to are insufficient for public health purposes generally, and notably so for the prevention of certain forms of tuberculosis. But I would ask them to remember, in the first place, that under our system of local self-government no power is vested in any central body either to compel authorities to adopt by-laws as to open spaces about dwellings or to dictate to them the precise amount of space to be provided. All that the Local Government Board is empowered to do is to refuse sanction to a by-law which, in their opinion, is so faulty that it fails to provide, as the statute requires, for "the sufficiency of the space about buildings to secure a free circulation of air," and for "the ventilation of buildings." And, further, it is no uncommon thing for those who place their own pecuniary interests before considerations of public health, first to get themselves elected on local District Councils, and then stoutly to maintain as "practical men" that the minimum spaces recommended must be reduced in urban centres because of the high cost of land, and that these spaces are altogether in excess of the requirements in districts which are as yet sparsely built on, because in such localities there exists such an abundance of light and air. The ignorant are beguiled by such pleas, especially when they are enforced by the contention that every extra foot of open space increases the cost, and hence the rent, of a dwelling-house. Difficulties such as these confront progress in

the administrative control of tuberculosis, and they can only be removed by educating the public, and by thus convincing them that the "practical man" on a District Council is generally sacrificing the highest of their interests, namely, that of their own health and that of their families, to his own selfishness and greed. In the spread of education as to the real causes of tuberculosis, and as to the extent to which it may be prevented by the influence of light and air, lies one of our greatest hopes for the still further control of this disease.

But, notwithstanding these hindrances to progress, a great change for the better has been, and still is, steadily in operation; and the diminution both in the crowding of dwellings on space and in the crowding within the dwellings, has coincided with the remarkable diminution in death from certain forms of tuberculosis which is shown by our national vital statistics.

Administrative measures, including the adoption of by-laws as to new dwellings, have also gone to secure much greater dryness of the sites and foundations of dwellings than formerly obtained. I refer to the draining of the subsoil, to the concreting of the ground surface of dwellings, to the provision of damp courses in walls, to the proper collection and disposal of rain falling upon roofs, and to the paving of yards. In this connection I would recall the classic work of the late Sir George Buchanan, which proved so convincingly that there exists a definite relation between the amount of soil-wetness and the amount of death from pulmonary consumption amongst those living on soils of varying degrees of dampness. Modern biological research has not yet divulged the precise nature of that relationship; indeed, I am not aware that any attempt has been made in that direction; but in view of the results which have followed on our early studies of the bacteriology of soil, it is not perhaps too much to surmise that the relation is a direct one, and that it may come to be ascertained that a certain amount of dampness in one and another soil is one, at least, of the conditions favourable to the multiplication of those bacilli of tuberculosis which are cast in such abundance on to the surface of the soil in this country, and still more so in others. One thing, however, is certain, and that is, that the reduction in

the rate of death from phthisis has gone hand in hand with a reduction in soil-wetness; and here again we have an indication as to one of the lines of further administrative action in so far as the surroundings of our towns, villages, and dwellings are concerned.

These references to administrative action in the past, incomplete though they necessarily are, may suffice to remind us that owing to them influences have been at work during the greater part of that period of nearly half a century covered by the vital statistics to which I have adverted, influences which largely account for that substantial diminution in death from tuberculosis generally, and notably from phthisis, which has taken place in this country.

This question of the control of human tuberculosis is no new one; it has been promoted by the sanitary service of this country for nearly fifty years, and hundreds of thousands of lives have been already saved in consequence. Indeed, if by the further aid which modern knowledge has given us as to the causation of tuberculosis as much is done in the next half-century as has been done in the past one, we shall in this country have absolutely abolished for some of those age-periods at which human life is of most value to the State all deaths now registered under "Phthisis," and most of those which are included under "All Forms of Tuberculosis." Naturally, I cannot hope as much for the future as has been achieved in the past.

But the influences I refer to, and many others due to administrative action of one and another sort, must have operated on persons at all ages; indeed, this is shown in the Table dealing with "All Forms of Tubercular Disease," and in that relating to "Phthisis," where it will be seen that the important reductions effected apply to infancy and childhood as well as to adolescence and mature age. Hence I am unable to find in these influences any sufficient answer to the question, Why has there been failure, and even worse than failure, to diminish the toll of death paid by our infant population from that form of tuberculosis which is registered under the name of "Tabes Mesenterica"? The absence of an answer is the more striking because during the same term

of years so many thousands of lives have been saved, especially during childhood, early youth, and adolescence, from the pulmonary form of tuberculosis; and the difficulty of the problem is further increased because we know that administrative improvements of the class referred to have secured for our child population, perhaps even more than for adults, who spend so much time away from their homes, those immense advantages of increased light and air which must necessarily have largely diminished their chances of receiving into their systems the infection of tuberculosis. In the face of all this the fact remains that the form of tuberculosis which is so essentially that of infancy and childhood has remained all but stationary as a cause of death, and has at one age-period actually undergone large increase.

If, however, we adopt the common belief that in the case of phthisis or pulmonary tuberculosis the tubercular infection is mainly received aerially, whereas in the case of tabes mesenterica it is mainly received by the digestive tract, we get an indication which tends to solve the difficulty. The various administrative measures to which I have thus far adverted have, in so far as tuberculosis is concerned, tended in the main to diminish the chances of the aerial diffusion of the tubercular infection. They have also tended to prevent those forms of pulmonary mischief which must necessarily facilitate the retention by the tubercle bacillus of its vitality and its power of reproduction when once this pathogenic organism is received into the lungs. Is it possible that during the period in which there has been so vast a saving of human life from that form of tubercular disease, namely phthisis, in which the infection is believed to be conveyed aerially, there have been in operation one or more influences under which the tubercular infection has had such increasing facilities for reaching the digestive tract as to have altogether outweighed, at least amongst our infant population, the benefits which would otherwise have followed a controlling action of the sort to which I have referred? I believe there have; and this leads me to consider how that infection may reach the digestive tract.

Here again I must set some limit to my answer. I do not

propose to discuss the various pathological processes by which this introduction to the digestive tract may at times be achieved; neither do I intend to do more than to accept the fact that even an aerially-carried infection reaching the mouth and nares may be conveyed to the stomach by the aid of the saliva. I am, indeed, so convinced that the main vehicle by which tubercular infection is conveyed to the digestive tract is to be found in certain food-supplies, that I propose strictly to limit myself to a consideration of articles of food, and the time limit alone forbids my giving prominence to more than two of such articles, namely, meat and milk.

As you are doubtless aware, the question which I now approach has been the subject of consideration and report by two Royal Commissions. The first, which was appointed in July, 1890, "to inquire into the effect of food derived from tuberculous animals on human health," reported in April, 1895. The second one, on which I had the honour to serve, was appointed in July, 1896, to inquire into "the administrative procedures for controlling danger to man through the use as food of the meat and milk of tuberculous animals," and it submitted its report in April, 1898. The question has also been the subject of careful study and report by a number of distinguished health-officers, physicians, agriculturists, and veterinarians, and any remarks which I may make on it must necessarily take account of, and be largely based on, the conclusions which have thus been arrived at.

Two of these conclusions, which I quote from the report of the Royal Commission of 1890, will suffice to justify the prominence which is given, for the purposes of these lectures, to the question of food-supplies in relation to human tuberculosis. One runs as follows: "Any person who takes tuberculous matter into the body as food incurs risk of acquiring tuberculous disease." The other is: "No doubt the largest part of the tuberculosis which man obtains through his food is by means of milk containing tuberculous matter." Taking these conclusions as a sort of text, I am driven at once to divide my subject into two parts. One deals with the influence of meat, the other with that of milk, in the production of human tuberculosis.

The demands for the adoption of administrative measures in order to control the risk to man of acquiring tuberculosis through the agency of meat have mainly come from certain medical officers of health having experience of public slaughter-houses and from persons who are engaged in the meat trade. The former have largely based their demands on physiological considerations; the latter, who naturally view the matter from a commercial point of view, have in the main enforced their requests by referring to what they consider as improper seizures of carcases and by quotations from the report of the Royal Commission appointed in 1890.

In considering these demands, I would note that they have, in the main, had concern with the meat derived from bovine animals. This has distinct interest for us, because whatever the influence of race may be on the occurrence of tuberculosis in the lower animals, it is certain that animals of the bovine race lead a much more unnatural life in this country than do sheep, for example, amongst which latter animals tuberculosis is comparatively rare. Indeed, next to the milch cow, and perhaps the pig, there is probably no animal the flesh of which is used as a food for man so liable to tuberculosis as the well-stalled bullock. In support of the contention that this contrast between bovine and ovine animals is not exclusively an affair of race, I would recall a piece of personal experience: When visiting the public slaughter-houses of one of our large cities, I was shown as a curiosity a group of cows. To me each cow seemed to consist of little more than a skeleton framework covered tightly with a hide, and in my ignorance I asked if the lot had been condemned, even before slaughter, as unfit for human food. To my astonishment, I was informed not only that this was not so, but that cows of the same class were often received from the same locality, and that they were peculiar inasmuch as tuberculosis was very rare amongst them. They were disused milch cows from some of the poorest of small tenant-farmers in the United Kingdom. Although they had been milked as long as it was practicable to milk them, they had mainly subsisted on such grass as they could pick up, and their former owners had been unable to provide for their protection in

stalls against inclement weather. In short, though in one sense their life had been a hard one, they had enjoyed the benefit—inestimable from the point of view of tuberculosis—of having lived in the open air.

As bearing on the same point, let me recall certain pieces of evidence that were laid before the Royal Commission of 1896. Dr. Marsden, Medical Officer of Health for Birkenhead, in referring to foreign cattle, stated that out of a total of 603,859 inspected in the lairages in the three years 1894 to 1896 only sixty-eight carcases were found in any way affected with tuberculosis, and that under a system of admittedly special stringency only twenty-one were seized on that account. In explanation of this small proportion of tuberculous animals and of seizures, he explained not only that the live animals were subjected to veterinary inspection before shipment, but, he added, "they are all wild animals, practically coming from the prairies and ranches, and they are never confined." Dr. Vacher, speaking as to a more lengthened experience, said to the Commission: "I think it is exceedingly probable and almost certain that tuberculosis is infinitely more abundant in home carcases than it would be in imported carcases." And this class of evidence is not limited to medical experts. Thus Mr. W. Field, M.P., President of the National Federation of Butchers and Meat-Traders, in answer to a question as to cattle imported from the States of America and Canada, said: "I have seen some hundreds of them killed, and I never saw a case of tuberculosis amongst them"; and he went on to explain that though these cattle were housed for seven months, "they have been all their lifetime before that . . . outside." Surely evidence of this character supplies a strong hint as to one direction in which control against tuberculosis, whether in man or amongst the lower animals, may effectually be exercised.

But tuberculosis in animals the flesh of which is used for human food, notably in those of the bovine race and in the pig, is a reality; and in considering how far it may be controlled by administrative measures, it will be well to ascertain, as far as this is practicable, what evidence is available as to the extent of the

mischief induced by the use, as food, of the meat of tuberculous animals. On this point I would again ask your attention to some of the statistics compiled by Dr. Tatham; and in doing so I would recall the fact that for the purposes of comparing one term of years with another, the value of the statistics in question is not in his opinion destroyed by reason of the variations that have taken place in nomenclature.

In the first place I would note the fact that, as regards "All Forms of Tubercular Disease," there has, during the forty-five years in question, been a substantial diminution in the death-rate; and secondly, that this diminution has been very marked during the period of life in which meat is most largely consumed. This diminution has ranged from no less than 52·8 per cent. at the age-period fifteen to twenty years to 30·8 per cent. at the age-period thirty-five to forty-five years.

But the form of fatal tubercular disease which is most common during the meat-eating age is phthisis; and when the vital statistics as to phthisis are examined for the period 1851 to 1860 and 1891 to 1895 respectively, we are met with the striking fact that the rate of death from this disease has undergone even greater diminution than has been the case as regards tubercular diseases generally. The diminution of death from "All Forms of Tubercular Disease" during the age-period fifteen to forty-five years averaged 45 per cent.; that from "Phthisis" averaged 48 per cent.

And further, it is matter of common knowledge that the term of forty-five years, 1851 to 1895, during which this enormous reduction in the amount of tubercular disease has been brought about, is a period during which there has been in this country an enormous increase in the amount of meat consumed. Whilst, therefore, I fully admit that there are conditions under which tubercular disease can be and is communicated to man as the result of the use as a food of the meat of tuberculous animals, I fail to find any evidence justifying the view that the disease is so communicated to any wide extent. To the limited extent to which vital statistics enable us to form a judgment, the conclusion would be in the opposite direction.

So far as I am aware, the most forcible contentions in favour of the adoption of stringent administrative measures such as would involve the seizure and destruction of all carcases exhibiting, to however small an extent, evidences of tuberculosis are based upon certain experiments which were carried out by the Royal Commission of 1890. It was desired to ascertain whether meat that might have been accidentally smeared with tubercular matter, as by the use of a knife with which tuberculous glands had previously been excised, or by the use of cloths used in dressing carcases, and which meat was subsequently rolled up and tied by string in such a way as to protect the interior from the action of a really high temperature during cooking, still retained tuberculous matter in an infective state. For this purpose it became necessary intentionally to contaminate a piece of meat, then to submit it to an ordinary process of cooking, and lastly, to use it for the purposes of a feeding experiment. Let me quote from the volume issued by the Royal Commission how this experimental contamination was effected:

"The experiments made were of two kinds. In the larger number of these experiments a piece of sirloin was obtained from a local butcher. From this sirloin the butcher was requested to remove the bone. It was then cut into a strip of from 18 inches to 24 inches long, and varying in thickness from 1 inch to 1½ inches. This was laid out on a table, and small incisions were made over the whole of the upper surface. An emulsion of obviously tubercular material was prepared by grinding and pounding down tubercular organs from cattle, pigs, or guinea-pigs, mixing this with milk, and passing the mixture through a fine sieve, the part kept back being again ground and pounded until it would all pass through. This emulsion was thoroughly rubbed into the incisions and over the whole surface of the meat, which was then rolled up from one end, so that layers of finely-divided tubercular material were enclosed at different distances from the surface. This roll was then firmly bound in all directions with string, so as to prevent as far as possible the access of boiling water between the layers."

Roasting experiments were carried out after similar prepara-

tions. In other words, for the purposes of this experiment an amount of tubercular material was purposely forced into the muscular tissue of the meat employed, which could never by any chance be approached in the case of an ordinary joint used for food. It was a laboratory experiment carried out with scientific completeness, and it was never pretended that it found its parallel in every-day practice—indeed, Dr. Sims Woodhead, who carried it out, takes care to state that "the quantity of tuberculous material introduced was no doubt considerably greater than would probably ever be present as the result of accidental contamination."

With meat thus treated certain animals—all guinea-pigs, except one pig and one cat—were fed twice a day. Fifteen animals which were fed with the meat after boiling were living twenty-eight days afterwards. All but two of them—namely, one guinea-pig and one pig—escaped infection. Similarly, twenty-one animals were fed on such meat after roasting, and of these five only developed tuberculosis—namely, four guinea-pigs and one pig. The escape of so immense a proportion of these animals —namely, twenty-nine out of thirty-six, or 80 per cent.—from so severe a test will be referred to later on in another connection.

Such positive results as were achieved under these altogether exceptional circumstances serve indeed to represent a risk, and even an occasional danger, but it is not one, in my opinion, that justifies some of the claims that have been based upon it. It should also be remembered that the Royal Commission of 1890, having these facts before them, reported that "tuberculous matter is but seldom found in the meat substance of the carcase," and referring to Dr. Sidney Martin, who gave much attention to the question of "smearing" meat, they add that he "sees no objection to the sale of meat substance from carcases which have shown only localized tuberculosis, and from which every particle of tubercle has been skilfully removed."

It is quite unnecessary to discuss with you the question of the urgent need for preventing by administrative control the sale of many tuberculous carcases that are now used for the purposes of

meat-supply, and especially of portions of carcases exhibiting general tuberculosis or tuberculosis of several of the internal organs. Such carcases are diseased in the sense which demands their seizure; they are most commonly the carcases of disused milch cows, but they may be those of heifers and bullocks which to the eye were healthy when alive. I would only at this point quote to you the conclusion of the Royal Commission of 1896, on which I served, as to the carcases exhibiting tuberculosis which in our opinion should be entirely seized, and as to those which may be used for food after removal of the affected organs:

"(*a*) When there is miliary tuberculosis of both lungs, (*b*) When tuberculous lesions are present on the pleura and peritoneum, (*c*) When tuberculous lesions are present in the muscular system, or in the lymphatic glands, embedded in or between the muscles, (*d*) When tuberculous lesions exist in any part of an emaciated carcase,	"The entire carcase and all the organs may be seized.
(*a*) When the lesions are confined to the lungs and the thoracic lymphatic glands, (*b*) When the lesions are confined to the liver, (*c*) When the lesions are confined to the pharyngeal lymphatic glands, (*d*) When the lesions are confined to any combination of the foregoing, but are collectively small in extent,	"The carcase, if otherwise healthy, shall not be condemned, but every part of it containing tuberculous lesions shall be seized.

"In view of the greater tendency to generalization of tuberculosis in the pig, we consider that the presence of tubercular deposit in any degree should involve seizure of the whole carcase and of the organs."

But how is action on these lines to be brought about? how is the very proper demand of the butchers for uniformity in the

conditions regulating the seizure of carcases on account of tuberculosis to be met? and how is such skilful handling of slightly tuberculous carcases to be attained as will secure the removal of the diseased portions in such a way that no risk shall attach to the remainder? I only know of one answer, namely, By the abolition, as far as this is practicable, of private slaughter-houses; by the provision in all large centres of population, whether technically styled urban or rural, of public slaughter-houses under the direct control of the sanitary authorities and their officers; and by the adoption of measures which will, as soon as practicable, provide a class of skilled meat inspectors. Much of this administrative action can only be effected as the result of legislation; but the properly administered public slaughter-house is demanded as an act of justice to those trading in meat; it is demanded in the interests of public health and of decency; it is demanded for the prevention of cruelty to the lower animals; and it is demanded in order to bring England—if not the United Kingdom—somewhat nearer to the level of other civilized nations in this matter.

Thus far Scotland has taken the lead amongst us. Her example is set forth in the Report of the Royal Commission of 1896, where prominence is given to the fact that Scottish corporations and municipalities have the power to declare that when a public slaughter-house has been provided, no other place shall be used for slaughtering, except for a period of three years in the case of existing registered slaughter-houses. The application of this statutory provision to England is denounced by some, but I have yet to learn that the value attaching to property and the sacredness of existing "rights"—so called—are less appreciated to the north of the border than they are to the south.

Another point that has been strongly pressed in recent years as an administrative measure that is called for in the interests both of justice and of public health is that of compensation out of public funds to the butcher wherever a carcase is seized on account of tuberculosis, such compensation only to be given in the case of cattle which have cost a certain minimum sum—say £8—and in no case to go beyond a maximum sum of £30.

On this question the Royal Commission on which I served was not unanimous. A majority of four members was opposed to compensation, a minority of three favoured it. As I was one of the opposing majority, I will endeavour to justify my attitude; but as the subject transgresses in some respects the limits I have placed upon myself in these lectures, I will do so as briefly as I can.

My main objections to compensation for carcases or portions of carcases seized on account of tuberculosis may be summarized as follows:

(1) That it is wrong in principle to call upon the public to give compensation to a man who, having made a purchase involving some pecuniary risk, and having placed the purchased article on sale for his sole profit, subsequently finds that the article in question is not one that, in the interests of the public, he can be allowed to dispose of.

(2) That the pecuniary risk involved in the purchase of animals of the bovine race, by reason of tuberculosis, is one that is well known and perfectly recognised.

(3) That, notwithstanding repeated applications on behalf of the Commission to be supplied with evidence showing that real hardship and substantial loss are incurred by butchers by reason of the seizure of tuberculous carcases, the general tenor of nearly all the evidence submitted was in precisely the opposite direction.

(4) That the representatives of the various societies and bodies who urged that compensation from public funds should be accorded to the butchers were almost unanimous in admitting that, in businesses extending over a long series of years, and often involving tens of thousands of carcases, they had either incurred no loss at all owing to seizures for tuberculosis, or any such loss had been altogether trivial.

(5) That such freedom from risk of financial loss in a commercial transaction is hardly to be met with in any other trade.

(6) That the few exceptions which came before the Commission were almost exclusively limited to a few towns where a standard

of excessive stringency had been maintained as to the amount and extent of tuberculosis which called for seizure of a carcase.

(7) That in all these exceptional instances those responsible for this stringency expressed their willingness to abide by any standard which might be authoritatively laid down by a Government department or other authoritative body concerned with the matter of food-supplies. Such a standard code of rules has now been laid down by the Royal Commission of 1896.

(8) That even in these exceptional cases by far the majority of the seizures had to do with the carcases of cows that had served as milch cows.

(9) That in view of the fact that milch cows have already been a source of profit as milk suppliers, and of the circumstance that in order to insure such profit they have generally been kept under conditions calculated to lead to tuberculosis, the grant of compensation would tend to encourage the very disease which should, as far as practicable, be prevented.

(10) That the danger to man of contracting tuberculosis as the result of eating meat from a carcase which, though in part tuberculous, is otherwise of really wholesome appearance, is both rare and trivial.

(11) That the amount of risk of pecuniary loss really incurred in purchase for the slaughter of apparently healthy animals may best be estimated by the fact that some butchers do not think it worth while to pay an insurance fee in order to cover it, which fee would, at the end of a year's transactions, cost them no more than 3d. or 4d. per beast slaughtered.

(12) That, in so far as vital statistics can be relied on to afford any indication of risk to consumers of meat, they go to show that, at the ages when meat is most used as a diet, there has not only been no increase of death from tubercular disease, but that persons living at these ages have been those which have signally profited by the general diminution in death from tubercular disease which has taken place in this country.

(13) That the large saving of life from tuberculosis at the ages in question has corresponded with a period during which there has been a large increase in the amount of meat consumed.

(14) That any use of Imperial funds for compensation in this matter, on the ground that the protection of the public health is involved, would be contrary to the action hitherto adopted in this country, and under which measures of public health carried out locally are paid for by the community carrying them out.

(15) That the use of Imperial funds for such a purpose would be liable to open the door to grave abuse.

Public slaughter-houses, officered by skilled inspectors and supervised by medical officers of health, are urgently required, amongst other reasons, for the prevention of tuberculosis in man. When these have been provided, and when rules such as those laid down by the Royal Commission of 1896 as to action with regard to tuberculous carcases are uniformly acted on, then this question of the seizure, on account of tuberculosis, of carcases which apart from that disease are deemed fit for human food, should, and I believe will, practically cease to exist. The remedy lies, not in resort to public funds for the purposes of compensating a particular trade, but in the adoption of administrative measures of control such as I have indicated.

But if efficient control is to be exercised over the carcases of beasts slaughtered in this country, a control corresponding as nearly as is practicable to that applied at home should be exercised over imported carcases; otherwise the contrast between laxity in the case of foreign carcases and stringency in the case of home carcases would be not only unfair, but it might act as an incentive to the transmission to this country of meat which would be condemned abroad. Indeed, this result has, in some measure, already been brought about, and it might easily increase, to the injury of those of our fellow-subjects who are compelled to buy the cheapest meat they can procure.

Opposition to this measure has been raised by some on the ground that such control is impracticable of application under the conditions affecting the discharge of carcases from ships on account of the carcases being sewn up in linen or like material, and because of other matters affecting the meat trade at the places of importation.

But such difficulties can, I believe, be easily met. Indeed, the Royal Commission of 1896, among the members of which were persons fully capable of weighing such considerations, were unanimous in reporting, amongst other things, that "in respect of foreign dead meat, seizure shall ensue in every case where the pleura have been stripped." If examination as to such stripping can be made, then the carcase itself can be examined; and it is the more important that this should be done, because in the case of foreign carcases the viscera have already been removed.

I would therefore submit for consideration whether it is not equitable, as well as in the interests of public health, that skilled inspectors should be appointed at all ports where foreign carcases arrive, and that these officers should be required to select from each ship's cargo a number of carcases for such examination as may be necessary to the protection of the interests of the public. The cost of the necessary staff and accommodation should, in my opinion, be paid by means of some trivial tax per carcase, to be levied on the importers.

LECTURE II.

I NOW come to consider how far and what measures of administrative control of our milk supplies is necessary to the prevention of tuberculosis. At the outset I would observe that if I have had hesitation in adopting some of the more advanced views which have been put forward, both as to the amount of risk to which man is subjected through the consumption of the meat of tuberculous animals, and as to the measures of control which have in consequence become necessary, I know no grounds which would justify me in attempting to minimize either the risk which arises from the consumption of the milk of tuberculous cows, or the grave consequences to which the practice of consuming uncooked milk has given rise in this country. Indeed, I am profoundly convinced that the danger is great and widespread, and that it is absolutely necessary for those engaged in the pursuit of preventive medicine to take a prominent part in arousing the public to a proper appreciation of the fatal consequences to which it gives rise.

I have already pointed out that the form of tuberculosis most identified with the reception of the tubercular infection into the digestive tract is that which in its fatal form is registered under the heading "Tabes Mesenterica." Examination of Dr. Tatham's statistics, which form an Appendix to the Report of the Royal Commission of 1896, will at once show how trivial is the incidence of death from this form of tuberculosis in adolescence and adult life, as contrasted with the heavy incidence of death from Phthisis and All Forms of Tubercular Disease. Take the age-period 15 to 45 years. The mean of the rate of deaths per million living at that age-period in 1891-95 was 2,060 from Phthisis, 2,251 from All

Forms of Tubercular Disease, and only 44 from Tabes Mesenterica. But when we come to ages when milk is either largely used, or forms the principal article of diet, the matter is altogether different. The rate of 44 from Tabes Mesenterica at ages of 15 to 45 years, rises to one of 1,577 per million living under 5 years of age; and under 1 year of age it reaches no less than 4,046 per million births.

So also, if you will compare the rates in Tables A, B, and C (pages 5, 6, and 7), and contrast the reduction of 27·9 per cent. which has taken place, under 5 years of age, during the last 45 years in All Forms of Tubercular Disease, and that of 66 per cent. in Phthisis, with the corresponding one from Tabes Mesenterica, which only reaches 3·0 per cent., you will see that in considering the latter cause of death we are dealing with a totally different state of affairs. I do not for one moment pretend that these rates lend themselves in any way to a strict comparison; but they serve at least to show that in the early years of life the causes of tuberculosis must be differentiated from those which are in operation, and which have already been so largely controlled, amongst older persons.

The matter, too, assumes a still more serious aspect if we limit ourselves to the *first* year of life, when milk is most largely used as a food; for then we find that the reductions in the rate of death from the various forms of tuberculosis, which reduction has been going on at "all ages" for about half a century, not only disappears, but is actually transformed into a large increase, reaching no less than 27·7 per cent. This in itself is grave enough, but its significance is still further emphasized when we remember what are the circumstances under which this increase in the rate of death from tabes mesenterica has gone on synchronously with a decrease in that from other forms of tuberculosis.

It is a recognised axiom in the science of preventive medicine that infant life is most sensitive to the evil influences of unwholesome surroundings, notably such as are known to be associated with excess of tuberculosis; and also that infant life responds perhaps more readily than life at any other stage to the removal of those conditions. During the 45 years in question unwhole-

some conditions have, in this country, been largely removed as the result of administrative measures, widespread and costly; and synchronously with this work there has been a reduction in the amount of death from tuberculosis at all ages, estimated to amount to a saving of some 48,000 lives every year in England and Wales.* It would be contrary to all experience to suppose that infants have not benefited by the action thus taken. They probably have benefited as much as or more than persons at more advanced ages, and yet notwithstanding this, we find that in infancy there has been this large increase in the rate of death from that form of tuberculosis which is held to be mainly induced by the reception of the infection through the agency of food. So also, this result has coincided in point of time with a very large increase in the consumption of milk, and with the many evils attendant on the increased, and, I fear, still increasing, practice of substituting cow's milk for that from the breast of the human female.

Indeed, from whatever point of view we regard this ominous increase in the rate of death from Tabes Mesenterica amongst infants, we are forced to the conclusion that it is largely related to the use as an article of food of the milk of the bovine animal.

I am, of course, conscious of the fact that the term "Tabes Mesenterica," as used in our records of the causes of death, is by no means a precise and definite one, and also that there is some connexion between tabes mesenterica and diarrhœa. Indeed, as Dr. Tatham has pointed out, the rates of death from these two diseases commonly rise and fall together. This probably admits to some extent of explanation on the ground of difficulties of diagnosis; but whilst the wasting of a chronic infantile diarrhœa may be erroneously certified as tabes mesenterica, I have no doubt that the emaciation and other symptoms associated with fatal tabes mesenterica are not unfrequently entered erroneously in the death register under terms such as "diarrhœa" and "wasting." Such errors probably balance each other.

Dr. Tatham suggests another explanation of this "relationship"

* Contrast between the annual rate of mortality from all forms of tubercular disease in 1851-60, and that for 1897, shows a saving of life in the latter year of 47,973.

between the amount of death from these two diseases, where he refers to the possibility that it may be due to the fact that "tabes mesenterica is really more fatal during epidemic diarrhœa years." I believe this to be to an important degree an explanation of the rise and fall in death from these two causes; but I would carry the point further. I greatly suspect that the existence of an intestinal condition leading to diarrhœa, or the absence of any such condition, largely explains whether or not an infant, or even an adult, will be susceptible to, or experience immunity from, the infection of tuberculosis.

I have elsewhere suggested that the micro-organisms of disease fail in their chance of effecting their pathogenic results when they impinge on surfaces that are, and that remain, in a healthy state; and that certain departures from the healthy state, especially of mucous surfaces, afford to these organisms precisely the means which are favourable to their vitality and multiplication. In the infant the most trivial circumstances lead to ailments affecting the mucous surfaces of the digestive tract, and these are often associated with diarrhœa; and here we probably have the explanation of a susceptibility amongst infants to receive the infection of tuberculosis through the agency of a food supply, such as milk, which is altogether out of proportion to that experienced by adolescents and adults, who also consume large quantities of the same food. And have we not here some explanation of the remarkably small proportion of animals that became tuberculous under those severe experiments to which I have already referred, in which meat thickly smeared with, and infiltrated with, tuberculous matter formed their daily food? It seems to me that a really healthy animal, whether man or one of the lower animals, is not easily susceptible to the harmful processes induced by a pathogenic organism such as that which we are considering, and to which he must so often be exposed, whether the bacillus be conveyed aerially or by means of food; whereas, on the other hand, when that organism reaches a surface which exhibits an evanescent or more lasting departure from that normal state which we describe as healthy, the matter is far different.

It now becomes necessary to consider more in detail what is the nature of the evidence to the effect that the milch-cow is a danger to man, in the matter of tuberculosis, through the agency of her milk.

We know that the bovine race is peculiarly susceptible to tuberculosis, and that it is the female which, to a much greater extent than is the case in the human subject, suffers most. The conditions favouring tuberculosis are also altogether exceptional in the case of the milch-cow. In the first place, there is the exhausting process involved in the long-sustained production of milk, a process associated in the milch-cow with the constant loss of fat, albumen and salts contained in milk, and with a consequent tendency to emaciation. These constitute "just those degenerative changes which reduce the vital resistance of the animal." To counteract this, as well as for the purposes of convenience and to insure the production of a large amount of milk, many cows are kept and fed under conditions which are altogether opposed to Nature. In towns especially they are kept in cowsheds where, for the purposes of warmth, they generally lie in couples in close contact with each other, with inadequate means of air-space and of ventilation; and it is no uncommon thing to find that cows, which in their natural state live and graze in the open air, never for one moment leave their sheds for the outer air during the whole period—often ranging from 8 to 12 months—in which they are used for milking. Their food, too, is especially selected with a view to the sustained production of milk. In fact, they are artificially turned into milk-producing machines. By my reference here to towns I by no means exclude country cowsheds in so far as conditions favourable to tuberculosis are concerned. That is a point to which I shall revert.

In forming some estimate as to the number of milch-cows in England and Wales affected with tuberculosis, very varied evidence is available. Some was submitted to a Departmental Committee appointed by the Lord President of the Privy Council in 1888; further evidence was laid before the Royal Commissions on Tuberculosis, and still more is to be found in veterinary and other works. Mr. T. H. Elliott, C.B., giving evidence on behalf of the

Board of Agriculture, explained that even by the rough test of a post-mortem examination, the number of milch-cows found to be tuberculous is such that "20 per cent. was well below the mark"; and he gave instances of variations from 40 to 96 per cent. which reacted to the tuberculin test, the 40 per cent. having to do with "healthy-looking cows." Indeed, if I take it for the purposes of these lectures that 25 per cent. of our milch-cows are tuberculous, I am confident that I greatly understate the case. There are in England and Wales about 2,100,000 milch-cows, and on this low estimate some 525,000 would be tuberculous.

But, happily, all tuberculous cows are not necessarily a source of danger through their milk. Indeed, in so far as immediate danger to the human subject is concerned, it is only the cow with tuberculosis of the udder that exhibits tubercle bacilli in the milk. An experiment carried out under the auspices of the Royal Commission of 1890 affords very strong proof of this. Dr. Sidney Martin selected seventeen cows which were believed to be tuberculous. Only fifteen of them, however, turned out on slaughter to be so, and of these remaining fifteen it was found on post-mortem examination that five had some tubercular affection of the udder. In the case of ten out of the fifteen tuberculous cows, eight had healthy udders, and two had an udder affection which was ultimately found not to be tuberculous. In no single sample of milk from these ten tuberculous cows with non-tuberculous udders could tubercle bacilli be found, and sixteen test animals, which were fed on, or inoculated with, their milk, remained perfectly free from tubercular disease. Of the five cows which turned out to have tubercular disease of the udder, three had tubercle bacilli in their milk, and two did not. Fifteen test animals were fed with the milk that contained tubercle bacilli, with the result that tuberculosis was produced in every one of them. The milk of one or other of the two cows having tubercular udder disease, without evidence of tubercle bacilli in the milk, was used as food for twelve test animals, and four of these became tuberculous. On the other hand, similar experiments, including the inoculation of animals, made with the milk of the two cows having an udder affection, which was found to be non-tuberculous,

failed to give tuberculosis to any of the test animals employed.

This evidence has been confirmed by subsequent investigations, as has also that which is summarized by the Royal Commission of 1890, to the effect that "The milk of cows with tuberculosis of the udder possesses a virulence which can only be described as extraordinary."

The limitation of actual danger from milk to the existence of tubercular disease of the udder is, however, of much less significance than might at first sight appear. The deposit of small tubercular masses in a bulky organ such as the udder of a milch-cow is most difficult to detect, and, as we have seen from one of the experiments already quoted, it is by no means always possible to detect the existence of tubercle bacilli in milk which is potent to communicate tuberculosis. In fact, it is very important to remember that the failure to detect tubercle bacilli in a single sample of milk in no way implies that another sample taken at another time from the same cow will not contain them. So also, the absence of any tuberculosis of the udder, detectable by a physical examination, is by no means a guarantee that obvious tubercular disease of that gland may not very soon manifest itself, for, to use words quoted in the report of the Royal Commission of 1890, the spread of tubercle in the udder "goes on with alarming rapidity." Indeed, the difficulty of detecting tuberculosis of the udder in its earlier stages constitutes one of the principal dangers to man as a consumer of cow's milk; and further, I would again quote the same report, firstly to the effect that "this [udder] affection is not peculiar to tuberculosis in an advanced stage, but may be found also in mild cases"; and secondly, to remind you that we have in milk "a liquid perfectly adapted for the maintenance of tubercle bacilli, and specially adapted for their transmission to other soils." Well may that Commission, in recapitulating their conclusions, say: "No doubt the largest part of the tuberculosis which man obtains through his food is by means of milk containing tuberculous matter." And well may we consider how far it is practicable, by administrative measures, to prevent the transmission, through the agency of milk, of this fatal infection from

the bovine udder to the receptive soil presented by the digestive tract of our infant population.

In determining what are the administrative measures of control which are necessary to meet this evil, the one which first presents itself to most minds is the exclusion of all tuberculous cows from dairies, and those who maintain that this measure should be carried out find some justification for their demand in the terms of the report of the Royal Commission of 1890. That Commission, in referring to certain results recorded by their technical sub-commissioners, report as follows: "Both Dr. Martin and Dr. Woodhead insist that no tuberculous animal of any kind should be allowed to remain in any dairy." And in another paragraph they say: "The withdrawal from dairies of every cow that had any disease whatever of her udder would form some approach to security against the serious danger incurred by man from the use of tuberculous milk, but it would not be an adequate security. The presence in a dairy of a tuberculous cow, as Drs. Martin and Woodhead have shown, is a decided source of danger to the public, especially having regard to what we have learnt respecting the rapid development of tuberculosis in the udder, and the degree of danger to milk-consumers incurred by the invasion of the udder in tuberculous cows."

But whilst thus endorsing this proposal, when discussing from the scientific point of view this question of the danger which man incurs of tuberculosis through the agency of milk, the Commission distinctly disclaimed any intention of advising as to "administrative procedures"—indeed, they regarded this as being beyond their province. Hence the appointment in 1896 of the second Royal Commission, to which the question of administrative control was submitted, and it is this latter question which I am now discussing.

What would be the effect of at once eliminating every tuberculous cow from our dairy-farms and cowsheds? Even on the low estimate which I have already given you more than half a million cows would have to be at once withdrawn from the milk-supply of England and Wales, and yet the majority of these cows are probably supplying milk which is derived from healthy udders;

and if we held the view that every cow which, in the hands of an expert working with material prepared according to an acknowledged standard, responded to the tuberculin test is to be rejected as a source of milk, then the proportion to be condemned as milk-suppliers would be very much greater. Whatever, therefore, the ultimate end which we may rightly seek to attain, we must at least commence on lines that are practicable of application.

Foremost amongst the measures to be advocated is the adoption throughout the country of regulations as to cowsheds which will give our dairy-cows a better chance than they now have of avoiding the infection of tuberculosis during the term in which they are confined in sheds and byres for the purposes of milk production.

At present both the law and practice are deficient in this matter. No department of Government is invested with the power of laying down regulations as to the construction, ventilation, or provision of air-space in cowsheds, the details of which they can enforce. All that the Government can do is to refuse sanction to the operation of any regulation which they "are satisfied on inquiry . . . is of too restrictive a character, or otherwise objectionable." The result is that the existing regulations differ widely in different districts in matters which we now know to be of vital importance. This is especially so as regards the provision of such an amount of air-space as shall secure adequate means of ventilation without causing an amount of draught such as will immediately lead to the closure of all openings intended to serve for ventilation—indeed, some codes of regulations adopted by certain local authorities, which are otherwise free from obvious objection, contain no provision whatever as to air-space per cow. Thus, taking 200 of such codes haphazard, I find the cubic capacity per cow to be as follows : In 88 cases, 800 cubic feet ; in 1 case, 700 cubic feet ; in 2 cases, 650 cubic feet ; in 17 cases, 600 cubic feet ; in 9 cases, 500 cubic feet ; in 6 cases, 400 cubic feet ; and in 77 cases no cubic capacity at all is specified.

The Royal Commission of 1896, whilst recognising the immense difficulty—indeed impossibility—of at once attaining all that is demanded in this respect, endeavoured to meet the more pressing need in this matter by laying down certain rules as to the con-

struction and registration of cowsheds, and they urged that power should be conferred upon the Local Government Board to require the adoption of those rules. Their recommendations as to this were as follows :

"(*a*) That in future no cowshed, byre, or shippon, other than those already registered, shall be permitted or registered in urban districts within 100 feet of any dwelling-house ; and that the discontinuance of any one already existing shall be ordered on the certificate, either of the medical officer of health that it is injurious to the health of human beings residing near it, or of the veterinary inspector that it is not a place wherein cows ought to be kept for the purpose of milk-supply, and that it is incapable of being made so.

"(*b*) That the conditions of the attached cowsheds that shall warrant the registering of a dairy in a populous place, whether technically urban or rural, in the future shall include the following :

"1. An impervious floor.

"2. A sufficient water-supply for flushing.

"3. Proper drainage.

"4. A depôt for the manure at a sufficent distance from the byres.

"5. A minimum cubic contents as regards such districts of from 600 to 800 feet for each adult beast, varying according to the average weight of the animals.

"6. A minimum floor space of 50 feet to each adult beast.

"7. Sufficient light and ventilation.

"While we have prescribed a minimum cubic contents and floor space, without mentioning definite dimensions affecting ventilation and lighting, we are distinctly of opinion that these are by far the most important, and that requirements as to cubic and floor space are mainly of value as tending to facilitate adequate movement of air.

"Existing cowsheds should be obliged to conform to the prescribed regulations within a period of twelve months from the time of the regulations coming into force.

> "The same conditions as those recommended for populous places should apply to cowsheds in sparsely populated places, except in so far as cubic contents per cow are concerned. As regards these cubic contents, such space per cow should be provided as would, in view of the surrounding circumstances, secure reasonable ventilation without draught. But the physical circumstances prevailing in different localities being so varied, we do not find it practicable to prescribe uniform minimum requirements in this respect."

With regard to these regulations you will note that in the matter of cubic contents a sliding scale of from 600 to 800 cubic feet is prescribed according to the weight of the animals. This is a point to which some importance was attached by certain representatives of the agricultural interest, on the ground that for different breeds of cows the average weight during life is very different; and it was held that if a space of 800 cubic feet is to be regarded as a desirable minimum to be laid down for cows generally, it should not be applied irrespectively of the bulk of the animal. I am informed that whereas a shorthorn cow will commonly weigh 10 cwt., an Ayrshire cow may be expected to weigh some 8 cwt., and a Jersey cow some 7 cwt. The sliding scale, has, however, this disadvantage: The constructive arrangements regulating the number of cows in a shed tend to be of a permanent character, whilst the breed of cow occupying the shed may often vary.

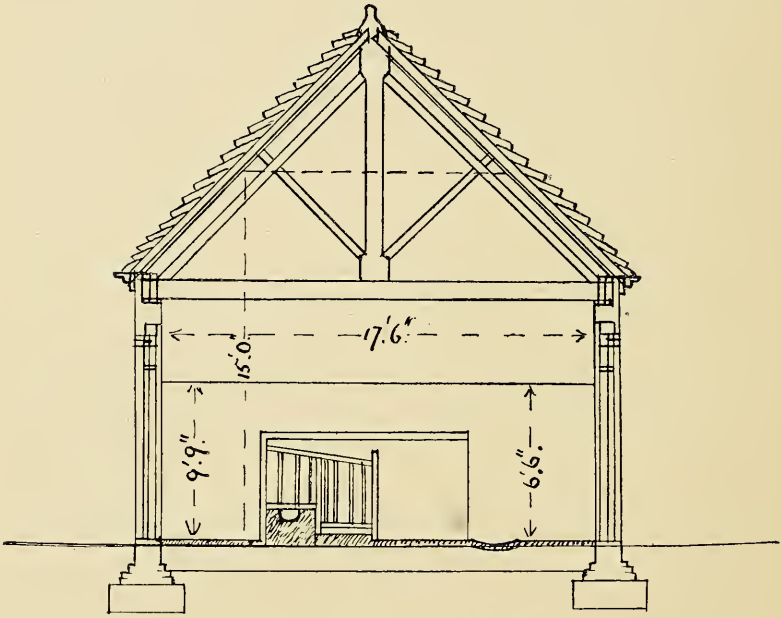
The audience which I am addressing knows only too well that in hospital construction the first point to be aimed at in the matter of air-space is to secure adequate movement of fresh air at the level above the floor at which the patient is breathing, and hence that the provision of adequate floor-space, and still more of wall-space per bed, outweighs in importance the provision of mere cubic space. In the case of milch-cows the need for maintaining bodily warmth is held to be one that cannot be ignored, and hence it is that so small a minimum as 50 square feet is all that it was deemed expedient to require at the present time. But it is a step in advance to maintain that a minimum amount of floor-

space must go hand in hand with a requirement as to cubic capacity; and to insist that both these shall go hand in hand with the requirement that the ventilation and the lighting of the cowshed shall be adequate. These latter, I repeat, are in the report of the Commission held to be "by far the most important requirements."

As regards cowsheds in sparsely populated districts, the Commission held that the same requirements should, with one exception, be observed; the exception being due to the difficulty of determining any precise amount of cubic space in other than populous places. There is, indeed, a general impression that cowsheds in rural districts need less control in this respect than those in urban districts. Whatever may be the case on large estates, and on dairy farms which are under intelligent supervision, some of which are thoroughly well administered, I can only say that, according to my limited experience, by far the worst constructed, worst ventilated, and the dirtiest cowsheds are to be found in villages, hamlets and rural areas. In many of our large towns and cities great improvements have been insisted on in the construction and ventilation of cowsheds; whereas in small farms on hillsides and exposed places, where movement of air is said to abound, I have often found that a most inadequate cubic capacity has coincided with the blocking up of every opening and cranny that could afford reasonable means of ventilation.

Whilst I am certainly no advocate for the retention of cowsheds in towns and cities, yet I am bound to say that, with the present neglect of rural cowsheds, the city byres often take precedence of the country ones in the matter of freedom from tuberculosis. Thus, of 144 samples of milk taken from cowsheds in the city of Liverpool, 4, or 2·8 per cent., exhibited the tubercle bacillus; whereas of 24 samples taken at railway stations of milk arriving from "the country," the tubercle bacillus was found in 7, or 29·1 per cent. Later investigations in Liverpool showed that a total of 228 samples of milk from city cowsheds gave 12, or 5·2 per cent. as infected with the tubercle bacillus, whereas in 67 samples derived from country cowsheds, 9, or 13·4 per cent. were found to be so infected. In Manchester similar inquiries have for

some time past been carried out, and it has been found that out of 93 samples of milk taken at the railway stations on its arrival from the country, 17, or over 18 per cent., contained the tubercle bacillus. Comparison between this country milk and that of cows in the city shippons was on this occasion not practicable, because earlier inspections had led to the removal from these city shippons of a number of cows suffering from sus-

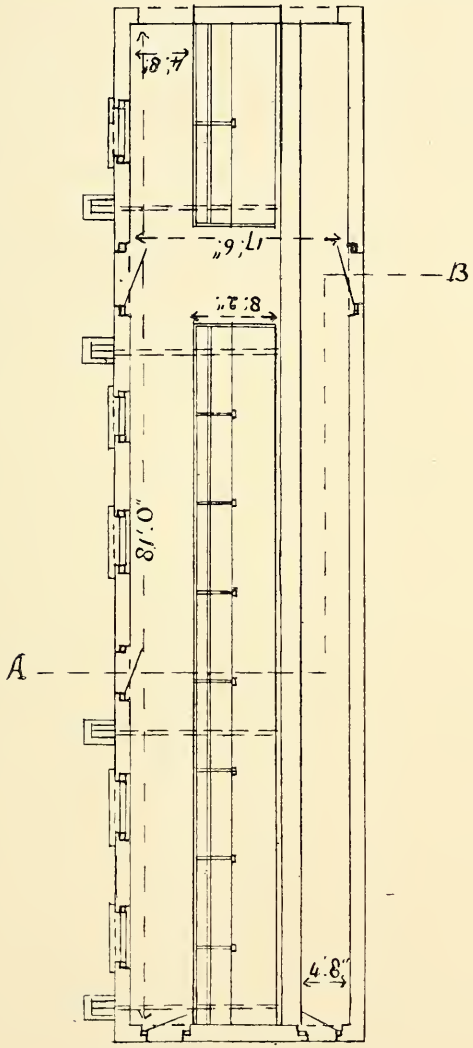


SECTION OF COWSHED.

picious udder disease, including five the milk from which contained tubercle bacilli.

Facts such as those to which I have adverted, taken together with the prolonged detention of milch-cows in sheds, point strongly to the need for more stringent and uniform control of these buildings. This will, I trust, before long be effected. I only wish I could also anticipate the speedy adoption of a regulation that would prevent cows being placed, as they now almost invariably are, with their mouths and nostrils to the wall. If the

object is in the most effectual manner to deprive them of all chance of breathing fresh and moving air, nothing could better have



Ground Plan of Cowshed.

achieved that end than the now prevailing system ; and when we call to mind the fact that tuberculosis in the cow is believed to be,

in the main, a matter of direct infection through the respiratory apparatus, this point becomes all the more important. To enact a requirement involving the abandonment of this practice would, of course, mean the provision of additional air-space; and this would under some climatic conditions involve measures of artificial warming to secure the temperature deemed necessary for remunerative milk production. In other words, it would mean increase of cost in the construction and in the maintenance of cowsheds.

As to this, however, it may be interesting to put on record a piece of personal experience. On a somewhat recent visit to a large, well-managed dairy-farm on the outskirts of London, I observed that the cows were stalled down the centre of a shed measuring 17 feet 6 inches in width, a passage 4 feet 6 inches wide being provided both in front of and behind the cows. On inquiring, at a later date, how far this excellent arrangement necessitated artificial warming in the winter months, I was informed in writing by one of the owners of the dairy-farm that although steps were taken during the colder weather to avoid actual draught, no artificial warming was ever resorted to. The "winter feed" for the cows, it was added, was found "sufficient" to enable them "to withstand any ordinary change of temperature." The writer, referring of course to an experience based on the climate of the metropolis, added: "I do not think a properly ventilated shed requires any artificial heating."

I need hardly say that the smaller the amount of air-space per cow, the greater the chance of mischievous draught. In the cowshed in question the space per cow is 960 cubic feet, 71 feet of floor space, and 4 feet of wall-space. (See Diagrams on pages 40 and 41.)

Mr. John Speir, one of the Royal Commissioners of 1896, has recently dealt with this subject of fixing cows with their heads to the wall, and he states,* as the result of experiments carried out in 1893 and 1894, that the air at the head of such stalls "was usually found more polluted than elsewhere." It is at the heads of the stalls that one tuberculous cow has most chance of infecting another, and it is precisely at this point that a sufficiency of moving air should be provided, if infection from cow to cow is to

be prevented. Mr. Speir, I need hardly say, is an advocate of byres with feeding passages—or, I might say, air passages—at the heads of the cows, and he holds that this air-space has a distinct advantage in preventing draught. He says: "The cold current from the [ventilating] openings loses much of its force and becomes considerably diffused before it has crossed the feeding passage, and consequently has a much less chilling effect on the animals."

Proper regulation of cowsheds would bring about other advantages in our milk supply than those which are concerned with the prevention of tuberculosis. To name one of these only. I would refer to the necessity of forbidding the storage of cows' dung within a specified distance of the sheds. At present the air of sheds containing large numbers of cows is laden with the smell of decomposing dung piled up in proximity to them, and it must necessarily be highly charged with those bacilli—such as *Bacillus coli*—which find in the large intestine their customary habitation. But enough has been said to show that proper control in the construction and management of cowsheds and their surroundings is an administrative measure that is urgently called for; and I may add that uniform efficiency in this respect can only be attained as the result of further legislation.

Another desideratum has to do with systematic inspection of dairies and sheds, and of all cows the milk of which is placed on sale. This should be carried out by the officers of the sanitary authority of the locality in which the premises are situated. But since the milk used in one district is now so often derived from one or more outlying or even distant districts, power should be conferred by statute for the inspection of cows, wherever they may be situated, by the officers of the authorities within whose districts milk from the premises in question is supplied; and this power should everywhere be supplemented by the further one to suspend or prohibit the sale within the district of an authority of milk from any dairy, whether obtained within or

* Paper read before the Newcastle Farmers' Club on the "Construction and Ventilation of Cow Byres," by Mr. J. Speir, of Newton Farm, Glasgow, on January 29, 1898.

without the district, whenever this is deemed necessary either by the medical officer of health or veterinary official by reason of the health of the cows.

Just as Scotland is ahead of England in the matter of public slaughter-houses, so also has she set us an example in this matter of the control of milk from tuberculous cows, wherever they may be situated. Sections 24-27 of the Glasgow Police (Amendment) Act, 1890, deserve consideration in England in this respect. These sections are as follows:

> "24. The medical officer or sanitary inspector, or any person acting under their orders, provided with and, if required, exhibiting the authority in writing of such medical officer or sanitary inspector, may from time to time, within reasonable hours, enter any byre or cowshed within the city or wherever situated if the milk produced therein is being sent for sale within the city, and may inspect and examine any cow kept therein for the supply of milk, in order to determine whether such cow suffers from any disease which might render the use of the said milk dangerous or injurious to health.
>
> "25. Every owner of any cow kept within the city for the supply of milk, or wherever kept if the milk is being sent for sale within the city, and every person in charge of the same, shall render such reasonable assistance to the medical officer, sanitary inspector, or other person provided with, and if required exhibiting the authority in writing of such medical officer or sanitary inspector for the purpose of inspection and examination, as may be required by them, and any person refusing such assistance or obstructing the inspection, shall be liable in a penalty not exceeding five pounds, and such penalty may be sued for and recovered before the sheriff of the county in which such person is domiciled.
>
> "26. Every dairyman or keeper of a byre or cowshed, whose milk is sold within the city, who, after intimation has been made to him by the police commissioners that any cow in his possession kept for the supply of milk for human

consumption suffers from tuberculosis or any disease which might render the use of such milk for human consumption dangerous or injurious to health, shall retain such cow in his possession, shall, unless the contrary be proved, be presumed to have sold the milk produced by such cow for human consumption, and shall be liable in a penalty not exceeding five pounds, and such penalty may be sued for and recovered before the sheriff of the county in which such person is domiciled, at the instance of the procurator-fiscal.

"27. Every person who knowingly sells, or suffers to be sold or used for human consumption within the city the milk of any cow which is suffering from tuberculosis, or any disease which might render the use of such milk dangerous or injurious to health, shall be liable to a penalty not exceeding ten pounds for each offence, and in any case where the person liable to a penalty under this section is not resident within the city such penalty may be sued for and recovered before the sheriff at the instance of the procurator-fiscal."

As a further step there should, to use the terms of the Royal Commission of 1896, be "power to prohibit the sale of milk from any cow certified by a veterinary surgeon to be suffering either from such disease of the udder as in his opinion renders the animal unfit for the supply of milk or exhibiting clinical symptoms of tuberculosis." And lastly, udder disease in the cow should be made a notifiable disease, and a penalty should attach to the sale of milk from any cow so suffering, unless the owner of the animal is in possession of a veterinary certificate to the effect that such disease is not tubercular.

The possession of these powers as to suspending or of prohibiting the sale of milk from certain cows will, in many instances, involve the seizure of the animals in question by the local sanitary authority, acting on veterinary advice; and here again, as in the case of the seizure of tuberculous carcases, we are met with the claim for compensation. But the circumstances are quite different. I have given my reasons for objecting to grant compensation for an article of food, like meat, which having been placed on sale for

the sole profit of its owner is seized because it is unfit for human consumption. But in the case of a milch-cow believed, or found on inspection, to be tubercular, the animal has not been placed on sale. Apart from her milk, which is "seized" by reason of its sale being prohibited, the animal may be of value for, and quite fit for, the purposes of meat supply; hence confiscation of the cow herself would be unfair.

If, therefore, in the exercise of a power conferred by statute the sanitary authority should seize such a cow in the interests of the public, the seizure should be accompanied by compulsory slaughter. And if, on slaughter, the animal should turn out not to be tuberculous, then her full value as a milch-cow should be given to the owner out of the local rates; whereas if, on the other hand, the animal be found to be tuberculous, only the value which the carcase may possess as a food supply or otherwise should be paid in compensation. The principles here laid down are, I believe, just and equitable. And it is worthy of note that whereas our national death returns from tuberculosis indicate no reason for departure from these principles in the case of our meat supply, those same returns point strongly to the need of their application in the matter of our milk supply.

Measures such as I have indicated would go far to control tuberculosis through the agency of milk; but it would be manifestly unfair, as well as wrong to the community, to apply them to the dairy-farms and cowsheds of this country, and at the same time to admit milk and milk products from abroad without submitting these to restrictions resembling, as nearly as practicable, those applied at home. Holding this in view, the Royal Commission, of which I was a member, made a recommendation to that effect, and they added that any costs thus incurred should be borne by the importers.

Just as I proposed in the case of foreign carcases, so I would urge in this connection that inspectors should take samples of milk and its products at our ports, and that these should be submitted to examination by experts in bacteriology and in chemistry, the cost of the necessary staff and work being paid for by a small tax on the milk, cream, and their products which are imported.

In the case of a foreign carcase found to be diseased, seizure would at once follow; but so perishable an article as milk could not be seized pending the necessary examination. It would therefore become requisite to adopt some other plan in the case of milk, for example, found to contain tubercle bacilli, or to be otherwise unwholesome. It may be better for me not to give in any detail my own opinion as to what this action should consist in; but some such step as an announcement in the *Gazette*, or other publication, to the effect that milk products imported from a specified place abroad were found to be dangerous to health, or the seizure and destruction of the next consignment from the same locality, may perhaps be accepted as affording some indication as to the lines on which the necessary action could be based.

There remains the danger of the direct transmission of the infection of tuberculosis from cow to cow—a danger which is the greater by reason of the fact that, to quote the words of the report of the Royal Commission of 1896, "the insanitary conditions under which dairy stock are often kept constitute highly favourable circumstances for the encouragement of tubercular disease, and for its dissemination among sound animals." The experience derived from Denmark as to the action taken on the basis of the results of the tuberculin test, goes to show how much may be done to avoid this danger. Dairy cows to the number of 144,800 were submitted to the tuberculin test, with the result that in 45,899, or 31·7 per cent., tuberculosis in some stage or other was detected. The detection of unsound animals is followed by their immediate isolation from the healthy ones. When the cows are housed this is effected by the simple and inexpensive process of placing one set on one side of a wooden partition erected across the byre, whilst the other set are stalled on the other side. Each spring and autumn the sound set of cows are re-tested, and any that respond to the test are placed on the unsound side of the partition, the process being repeated so long as any react to the tuberculin.

In one typical farm, at Thurebylille, this process had been carried on for five years. When the test was first applied, in

1892, it was found that 131 out of 208, or nearly two-thirds of the animals, were tuberculous, whereas in 1897 the matter was reversed; for out of 204 animals only 55, or one-fourth, reacted, the bulk of the animals being sound, and this notwithstanding the fact that the disease must constantly have been introduced afresh by means of newly purchased animals. Such action, if combined, in England, with proper administrative control of cowsheds and of the animals in them, would probably be even more efficacious than in Denmark in securing the elimination of tuberculosis from our dairy stock. But the testing, to be trustworthy, must be applied under the supervision of experts, and the tuberculin must be of a guaranteed standard potency. How far control of tuberculosis in this direction should be administered under the direction of the State is, I believe, a matter on which there is some difference of opinion. The Royal Commission was, however, unanimous in making recommendations in this sense; and I am bound to say that I find it difficult to understand how the desired end of protecting the public health in this way can be properly attained, except as the result of some such action by the State as that which is adopted for the control of small-pox, and in which both the vaccinator and the necessary lymph can be obtained at the public cost.

Thus far the measures of control which I have suggested have had concern with the cow, and the means of caring for her; but knowing as we do that the dried sputa from phthisical persons are easily mingled with the air, that tubercular infection of the cow is held to take place mainly through the medium of the air, and that aerial infection of milk easily takes place, it should be an invariable rule that no individual suffering from tubercular consumption should be employed in connection with milch-cows, with dairy processes, or in the sale of milk, and such inspection and control as I have already advised should be accompanied by periodic examination of dairy employés, and certification as to their freedom both from tubercular and other infections. Regulations can already be made under the Dairies, Cowsheds, and Milk-shops Order, rendering it unlawful "to allow any person suffering from a dangerous infectious disorder . . . to milk cows or to

handle vessels used for containing milk for sale, or in any way to take part or assist in the conduct of the trade or business of the cow-keeper or dairyman, purveyor of milk or occupier of a milk-store or milk-shop, so far as regards the production, distribution, or storage of milk. . . ." But when this regulation was drawn up in 1885, the term "dangerous infectious disorder" was not regarded as including tuberculosis, and restrictions, based on the assumption that an acute infectious disorder, such as scarlet-fever, was in question, and involving control of persons who had even "been in contact" with a person so suffering, may raise some difficulty in applying this to a disease lasting at times for many years; besides which no provision is made for ascertaining whether a person is so suffering. This point raises the question of the notification of tubercular disease, notably phthisis, in man, a question to which I shall refer in my next lecture. Then again, the adoption of such a regulation cannot, as the law stands, be enforced, and it seems clear that to effect this, as well as other necessary reforms in relation to our milk-supply, fresh legislation will be required.

Before leaving this question of dairy and cowshed regulation I am anxious to refer to the onesidedness of most that has been achieved in this respect. Visits to cowsheds, where the milking is carried out, almost habitually reveal conditions of filth which cannot do otherwise than lead to the contamination of the milk, by reason of dung, dirty hands, and otherwise; but if we follow the milk into the dairy, we generally find a cleanliness rendered almost brilliant as the result of burnishing, clean garments, and otherwise. This cleanliness unfortunately comes too late; the mischief is already done by the antecedent dirt.

In bringing this lecture to a close, I must ask your indulgence if I trespass for a moment beyond the limits which I laid down for myself when I chose the title by which it was to be governed. The point to which I desire to refer is a measure for the control and prevention of tuberculosis in man, which cannot be brought about as the result of an administrative measure; but I cannot take upon myself the responsibility, when speaking of the relation

of milk to human tuberculosis, to pass over in silence a means of absolute and certain prevention which every householder has at his or her own disposal—I refer to the boiling, sterilizing, or "Pasteurising" of milk.

It is a somewhat curious fact that the inhabitants of the United Kingdom stand almost alone amongst civilized nations in the habitual use of uncooked milk as a food. This is the more to be regretted because, by reason of this practice, human life, especially that of infancy and childhood, is being sacrificed on a scale which, to use the mildest term, is altogether deplorable. That this should be so is also altogether unreasonable in the face of the certain knowledge we possess, and which is set forth in the report of the Royal Commission of 1890 in the following words: "The most deadly tubercular material can be rendered absolutely innocuous, in so far as any spreading of infective disease is concerned, by the action of a temperature at which water boils." And again: "It is sufficient to state that boiling, for an instant even, renders the tubercle bacillus absolutely innocuous."

Milk exposed to a temperature of 100° C., whether by boiling or other form of cooking, will not convey tuberculosis, and milk sterilized, as by placing it over the fire in a saucepan, which stands in another one filled with water, until it has reached a temperature of some 80° C. to 90° C., or perhaps even less, is an equally innocuous food. Nevertheless with this knowledge at our disposal, and whilst we know still further that some 7,000 persons (mostly infants) are annually killed in England and Wales by that form of tuberculosis called "tabes mesenterica," besides some thousands more by tubercular meningitis—a cause of tuberculous death which is on the increase under three months of age, is undergoing no diminution at the next three months of life, and which exhibits substantial increase during young adult life—we find people apparently intelligent, including even heads of young families, who discard this means of prevention on the mere ground of "taste." And what is still more striking and reprehensible is the fact that in many of our hospitals established for the cure of disease no effort is made to avoid in this way the chance of imparting tuberculosis, merely because the effort would cause some

inconvenience. The avoidance of all that is septic in connection with surgical operations stands in striking contrast with the courting of infection in the wards by the use of uncooked milk. But even the taste which attaches to boiled milk, and to which infants become at once reconciled, may be largely avoided if the milk boiled after the morning delivery be stored in the cool for use in the afternoon, and if the afternoon milk be similarly set aside until morning.

But some allege another objection. It is maintained that cooked milk is less nutritious than raw milk. I admit that there is an element of truth in this. Milk is a fluid having a biological character; it is a living fluid, and this character is destroyed by boiling or sterilization. From the purely scientific point of view it is most desirable to bear this in mind, but in its practical aspect it is well to remember that the slight diminution in nutritive value which cooking brings about in milk cannot be named side by side with the immense gain in freedom from the risk of infectious disease and death which is thus insured.

One word more. Milk, as it comes from the normal milk gland, is a sterile fluid, and it would be well for future generations if mothers could be brought to realize that "there is no sterilizing apparatus that can give results comparable with those provided by Nature in the healthy female breast."* Happily I can add that tuberculosis in the human milk glands is a disease so rare that it hardly needs consideration in connection with the feeding of infants. At the child-bearing age it is all but unknown.

Dr. Sidney Martin informs me that out of some 9,000 patients, mostly suffering from tuberculosis—namely, phthisis—which have come under his own care, he has never met with tuberculosis in the mammary gland. He adds that in only one instance has such an occurrence been brought under his notice, in the patient of another physician, and even that case he regarded as more than doubtful.

Dr. Sims Woodhead, in his work on "Bacteria and their Products," says: "It is a somewhat singular fact that, although

* "Soil and Circumstance in their Control of Pathogenic Organisms." Inaugural Address by Sir Richard Thorne Thorne. *Birmingham Medical Review*, December, 1897.

tuberculosis is frequently met with in young married women, tubercular disease of the breast is extremely rare. . . . In cattle, on the other hand, where the mammary gland carries on its functions when the animals are placed under conditions which are far from healthy, or at any rate far from normal, this tubercular disease of the milk gland is not by any means of infrequent occurrence."

The need for educating the public of this country as to the risks involved in the use of raw cow's milk, and as to the simple methods by which these risks can be effectually avoided, is a pressing one, and it can only be met by enlisting the active services of my own profession. Our influence in such a matter is necessarily considerable; our responsibility is a correspondingly heavy one.

LECTURE III.

Up to the present stage of these lectures I have felt no difficulty in expressing my views without reserve on the subject of the administrative measures which ought to be adopted in order to the control of tuberculosis. But I have now to consider a proposal with regard to which I know that my views are at variance with those of some of the most distinguished members of the public health service of this country. I refer to the question of the compulsory notification of tuberculosis in man.

You are, of course, aware that Section 6 of the Infectious Disease (Notification) Act, 1889, specifies a certain number of diseases deemed to be "infectious diseases" for the purposes of that Act; and also that Section 7 of the same Act enables a local authority to order that the Act shall apply in their district to other infectious diseases than those specified in Section 6, provided that no such order shall have validity until it has been approved by the Local Government Board. Applications have been made to the Local Government Board from time to time for their approval to the addition, at one time, of tuberculosis, at another, and more frequently, of phthisis, to the list of infectious diseases which are to be the subject of compulsory notification. Hitherto no such approval has been granted; and I can perhaps best approach my subject by giving some account of the considerations which that Board has held in view in refraining from granting the necessary approval.

In thus opening the subject it might appear that, owing to my official relations with the Local Government Board, I labour under the disadvantage of merely endorsing to-day a line of action to which I had officially committed myself in advance; but,

fortunately, this is not the case, for it so happens that, by reason of a somewhat lengthened absence abroad, the decision come to was not of my initiation. I have, however, the great advantage of being in entire concurrence with that decision, and at the same time of holding an independent view in the matter. In that which I am about to say on this subject I shall, therefore, have no hesitation in putting forward my own views, as well as those on which the official decision was come to, without attempting to discriminate between the one and the other. And, for purposes of convenience, I shall limit myself solely to the question of the compulsory notification of phthisis, this being the form of tubercular disease which is most easily communicable from person to person, and the communication of which may be most easily controlled by such administrative measures as are applicable to the human subject.

At the outset, I would desire to express my entire sympathy with those who advocate compulsory notification of phthisis. Their motive is absolutely unselfish; they are actuated solely by the desire to control the spread of a disease which destroys the health, the prospects, and the lives of many who constitute the choicest portion of our population, namely, those adolescents and young adults who are the mainstay of the vigour, the well-being and the happiness of our British homes, and of our national prosperity. If I cannot concur with some of my fellow-workers in their conviction that we can best save life and promote a higher standard of public health by this particular measure of control, it is because I feel certain that the compulsory notification of phthisis is calculated to retard the very object which they have in view, not only by alienating the public in regard to measures of prevention which cannot succeed unless they have the support of public opinion, but by placing insuperable hindrances in the way of that early treatment of the disease on which the arrest of its further progress and its cure are so largely dependent.

One of the first objections to the compulsory notification of phthisis under the Infectious Disease (Notification) Act, 1889, is that phthisis is a disease the inclusion of which amongst the infectious diseases to which that Act applies was never intended.

What are the diseases specified under Section 6? They are: "Small-pox, cholera, diphtheria, membranous croup, erysipelas, the disease known as scarlatina or scarlet fever, and the fevers known by any of the following names—typhus, typhoid, enteric, relapsing, continued or puerperal."

Now all these diseases have special characteristics which lend themselves to notification, and to such restriction of the liberty of the subject as can be rightly demanded in the interests of the public. They are all diseases of an acute character, which, quite apart from the question of notification, render it necessary to place certain restrictions on the sufferer for his own personal benefit. They are all diseases in which the infective stage is of a limited, and as a rule of very short, duration; and during a substantial portion of this infective stage the physical condition of the sick persons makes it necessary that they shall be under the control of those who are tending them, whilst for the remainder they are generally quite willing to be subjected to a control which, at the outside, will be of a few weeks' duration. And again, they are all diseases in which the sick persons are, for an important portion of the limited time of their illness, unable, by reason of their physical condition, and notably by reason of their presenting obvious indications of their infective state, of taking part in ordinary pursuits. These are conditions which justify the State in giving to those who are responsible for the public health and for preventing the spread of disease the power to require the notification to them of the existence of such dangerous disease, in order that they may, for a few weeks, so control the sick persons to prevent their being a danger to others by the diffusion of their infection.

In the case of phthisis, however, we find not only that every one of those conditions is absent, but that, on the contrary, precisely opposite conditions obtain. Thus, phthisis is commonly a chronic, not an acute, disease, and it often happens that during a long term of years there is no reason, other than their opportunity of ejecting infective sputa, which can be urged for placing phthisical persons under any control or restriction. Then, again, the infective stage is not limited to a few weeks, during most of

which time the patients are, quite apart from their infectiveness, necessarily under the control of friends or relations, doctors and nurses. And lastly, it is commonly the case that, during a long period, perhaps extending to years, during which they are suffering from phthisis, the patients are physically able to perform the ordinary duties of life. In these respects, therefore, there is absolutely no parallel between the diseases named in the Infectious Disease (Notification) Act and the vast majority of cases of phthisis. On the contrary, the two sets of diseases stand in striking contrast. And the same want of similarity applies also to those infectious diseases which have, on the demand of the local sanitary authority, been added from time to time in a number of towns, either temporarily or permanently, to the statutory list of notifiable diseases, namely, measles, whooping-cough, cholera, and, in a few instances, that form of infectious diarrhœa in infants and children which is known under such names as epidemic or autumnal diarrhœa.

It is only right, however, whilst pointing out how phthisis differs in so many respects from the several diseases named, to state that it resembles them in one important respect, namely, that it is an infectious disease, communicable from person to person, and that in this sense it is, to use a statutory term, a "dangerous infectious disorder." But whilst this is so, yet it should be remembered, on the other hand, that phthisis as an infectious disorder differs from the other infectious diseases in the circumstance that the infection, instead of being almost entirely beyond control of the affected persons, is all but limited to the sputa, the disposal of which they can easily control.

A second objection to the compulsory notification of phthisis has to do with the difficulty of ascertaining how far practical measures for its prevention can be applied as the result of such notification. The duty of approving or not approving of the addition of phthisis to the statutory list of notifiable diseases is one imposed on the Local Government Board by the Legislature; and that Board has hence the responsibility of deciding how far any such application is reasonable or not. With a view of determining this, it was at one time a not infrequent practice on

the part of the Local Government Board to ask sanitary authorities who wished to make phthisis notifiable in their districts to inform the central authority in the first instance as to the precise action which they proposed to take on the information which notification would provide as regards a disease which might often last for a number of years, during which period it would, as a rule, be essential that the persons whose disease would be notified to them should be able to follow an occupation which would enable them to maintain themselves and at times also to maintain a family. I have read a number of these answers, and I am bound to say that I never yet saw one which, in my opinion, would have justified the statutory approval which was asked for. Some authorities, indeed, appeared to find no answer at all, for the letter of inquiry brought the correspondence to a close. Others made it clear that they had never fully realized the import of their request; indeed, a number of them at once limited their proposal to the adoption of such measures as the disinfection of rooms, clothing, bedding, etc., after the death of any phthisical patients; and some of these explained the limitation to action after death by stating that it would be useless to take these steps before death because patients would be liable at once to reinfect the rooms and articles dealt with so long as they remained in contact with them. Action of so restricted a character does not appear to me to require or to justify compulsory notification of the disease; it could equally be carried out if deaths from phthisis were included amongst those deaths from infectious diseases of which so many sanitary authorities now obtain immediate information from the Registrar of Deaths for a trivial payment of 2d. per entry.

At the other extreme, proposals have been made for the periodic visitation of patients at their homes, in order in the first instance to inculcate certain practices which are most desirable from the point of view of controlling infection. I refer to the giving of advice as to the avoidance of expectorating on floors or in the streets; the use either of special spittoons containing disinfectants or of special Japanese paper handkerchiefs, to be burned after use; the desirability of sleeping alone

when this is practicable, etc. It is often proposed that on the occasion of these visits codes of directions embodying the necessary suggestions should be handed in in the form of leaflets printed by the local sanitary authority, and that both the patients and members of their families should be advised as to the conditions involving danger, and how these may best be avoided. But a single visit of this sort is naturally deemed to be insufficient; it is hence to be followed up from time to time by other visits, in order to see if the directions given are or are not being carried out, to ascertain if the patient has removed to another residence, and in order to the adoption of additional precautions, including measures of cleansing and disinfection, either during the serious illness of the patient, or on removal to hospital or elsewhere, or, again, on the occurrence of death. Then, again, it has been stated by some authorities, who appeared to anticipate some difficulties in the matter of these visits, that they would only be paid, and the advice would only be given, in co-operation with the medical practitioner in attendance on the patient. A further proposal has been made—but in no case, so far as I know, by a local authority—that sanatoria should be erected under the statutory powers conferred on such authorities as to the construction, at the cost of the rates, of hospitals for the prevention of infection; and that persons who are deemed by reason of phthisis to be a marked source of danger to their families and to the community should be induced to go into a sanatorium until at least they had been taught the several measures of precaution that they should adopt against the diffusion of their infection.

Such measures, if they could be and really were carried out systematically for such a period—whether a term of years or less—during which they were required, could not fail to be of value in the prevention of tubercular disease. But is it likely that they would be so carried out in this country?

Before attempting to answer this question let me refer to the action taken in this direction by the Board of Health of New York, for this action has more than once been held up as one worthy of our imitation. Quoting from a recent annual report

by Dr. James Niven on the health of the city of Manchester, it appears that on January 19, 1897, the following amendment of the sanitary code of New York was adopted by the Board of Health :

> "Section 225.—That pulmonary tuberculosis is hereby declared to be an infectious and communicable disease dangerous to the public health. It shall be the duty of every physician in this city to report to the Sanitary Bureau in writing the name, age, sex, occupation, and address, of every person having such disease, who has been attended by, or who has come under the observation of, such physician for the first time, within one week of such time. It shall also be the duty of the commissioners or managers, or the principal, superintendent, or physician, of each and every public or private institution or dispensary in this city, to report to the Sanitary Bureau, in writing, or to cause such report to be made by some proper and competent person, the name, age, sex, occupation, and last address of every person afflicted with this disease who is in their care, or who has come under their observation, within one week of such time. It shall be the duty of every person sick with this disease, and of the authorities of public and private institutions or dispensaries, to observe and enforce all the sanitary rules and regulations of the Board of Health for preventing the spread of pulmonary tuberculosis."

But at the same time a circular, originally issued in 1894 in connection with certain resolutions adopted by the Board of Health as to reporting certain cases of tuberculosis, was modified so as to meet the terms of the new legal requirement, and was then re-issued. This circular contains the following words: "This information is solely for record, and in no instance will visits be made to such persons by the inspectors of the department, nor will the Health Department assume any sanitary surveillance of such cases, unless the person resides in a tenement-house or lodging-house (unless in other cases the attending

physician requests that an inspection of the premises be made)." And again : " In no case where the person resides in a tenement-house or lodging-house will any action be taken if the physician requests that no visits be made by inspectors, and is willing himself to deliver circulars of information, or to furnish such equivalent information as is required to prevent the communication of the disease to others."

Such limitation of sanitary intervention seems to have been purposely maintained ; for in an address delivered before the British Medical Association by Dr. Hermann M. Biggs, of New York, in August, 1897, it is stated, in a sentence following that in which Dr. Biggs announces the legal enactment of January 19, 1897, that " Public institutions, hospitals, asylums, houses, etc., are now required to report . . . every case of tuberculosis coming under observation within one week of such time "; and again : " The purpose of this procedure is to keep under more or less constant supervision those cases of pulmonary tuberculosis which occur among the poorest classes of the population."

The circular referred to contains other clauses specifying the measures which will be adopted in the case of tenement and lodging houses, provided the visits are not objected to by the medical practitioner in attendance. These measures include visits of inspectors, the distribution of circulars of information, recommendations as to cleansing and disinfection at different times, and notably after the removal of or the death of a phthisical person. And, apart from this, there is also an offer to examine sputa bacteriologically at the public cost.

But, I would ask you if a system thus limited to special classes of dwellings and people, and even then only applicable with the permission of the medical practitioner in attendance on the phthisical person, has any resemblance to that which must necessarily follow on the inclusion of phthisis amongst the diseases named in the Infectious Disease (Notification) Act, 1889? It is a system which seems to me to be compulsory in a most limited sense. The compulsion goes so far as to enable an authority to compile statistical returns and to maintain a certain control over inmates of certain institutions and persons ; but the success of

the system depends largely on the goodwill or the expressed desire of medical practitioners whether any official sanitary control is to be exercised or not. It is, for any purposes of prevention that can be deemed applicable to the population generally, a voluntary, not a compulsory system; and in this country no statutory effect could be given to a similar system under the present law.

Dr. Hermann Biggs further states in his address to the British Medical Association that the New York Board of Health began as far back as 1889 "an educational campaign in relation to the causation and prevention of tuberculosis," by the free issue of information on the subject through the agency of leaflets and otherwise. He then goes on to refer to the action following on the new legal requirement as to notification; but before he gives the results of this action he explains the other measures which had already been in operation. Thus he announces that antecedent to the legal enactment of 1897 information was obtained as to cases in public institutions, instructions were issued in the homes of certain phthisical persons reported to the Board, and soon after 1892 bacteriological examinations of sputa were commenced and carried out on a somewhat wide scale. Cleansing and disinfection were also carried out after death; the sale of milk and the state of cowsheds were placed under regular control, and milch cows found by the tuberculin test to be diseased were slaughtered.* And summarizing the results of all the action taken antecedent to the passing of the legal enactment as to notification of tuberculosis, etc., he states that "most beneficial effects have already resulted from the various measures instituted for the prevention of this terrible disease." Whilst it is impossible to differentiate between that which was brought about by one and another of the various measures adopted, or even to say to what extent the satisfactory results referred to have been due to general measures of sanitary progress such as those which in the case of phthisis in this country have at many age-periods

* All the milch cows in New York were in 1897 subjected to the tuberculin test, and Dr. Hermann Biggs announced that it was intended to require the same test to be applied to all cows the milk of which is sent into New York city. The slaughter of all milch cows found to be tuberculous is stated to have been found impracticable. See *British Medical Journal*, November 19, 1898, p. 1579.

already effected a saving of considerably more than half the number of lives formerly sacrificed to this disease, it is quite certain that Dr. Hermann Biggs cannot be referring to the results of an enactment only passed a few months before he delivered his address.

I would, however, studiously avoid minimizing in any way the obviously beneficial results which may be obtained under a system such as that which is facilitated for certain classes of dwellings and persons in New York, and under which it is stated that "in nearly one half of the cases occurring in many parts of the tenement-house districts of the city it is found that more or less efficient precautions are being taken" for the prevention of phthisis. The effect of such a system is most beneficial by reason of its educational aspect; indeed, as Dr. Hermann Biggs puts it, "there has been a most gratifying increase of knowledge and intelligence" as to the nature of this disease, which affords "the greatest promise for the future." But it has been suggested that the mortality statistics of New York afford evidence of the value of compulsory notification for phthisis. I am not aware of any such statistics. From those given by Dr. Hermann Biggs it is clear that the death-rates from "All Tuberculous Diseases" and from Phthisis in New York City have been undergoing a very important diminution. In 1886 the annual death-rate from "All Tuberculous Diseases" was 4·42 per 1,000 living, and it diminished almost without a break until it was only 3·06 in 1896. In the same way the phthisis rate fell from 3·79 in 1886 to 2·58 in 1896. But this progressive diminution set in several years before the "educational campaign" was initiated in 1889; it had been in full operation long before the date of the resolutions and circular of 1894; and no data have been issued which can be regarded as giving information as to the effects of the enactment of 1897.

Whilst I am desirous of omitting nothing that is essential by way of proof offered as to the advantages that have followed upon the New York system which was in use before 1897, it is equally my duty to call attention to the difficulties experienced under it. It involves the visitation—at what frequent or infrequent intervals I cannot say—of at least 20,000 cases of well-developed pulmonary

tuberculosis in that city, besides "an additional large number of obscure and incipient forms of disease." Then again, a "great obstacle to practical success," says Dr. Hermann Biggs, lies in the fact that the necessary precautions cannot, in a large number of cases, be adopted without the establishment, under the direct control of the Health Department, of special hospitals for the treatment of this disease; and hence numerous instances are met with every week "in which members of many households, numerous inmates of crowded tenement-houses, employés in dusty and unventilated workshops, and many others . . ." reject all proffered assistance and instruction. "In such cases," adds Dr. Hermann Biggs, "sanitary suggestions are futile, and removal to a hospital constitutes the only effective action."

But that which strikes me even more forcibly is embodied in the words used by Dr. Hermann Biggs in another part of his address setting forth this New York system—a system, be it remembered, which, apart from its educational character, is, as I have explained, both limited in its application to the public and is admitted and largely subordinated to the voluntary action of medical practitioners. Paying a courteous compliment to our Metropolis, and expressing a hope that New York may come to equal our low death-rate, he proceeds thus:

> "The Government of the United States is democratic, but the sanitary measures adopted are sometimes autocratic, and the functions performed by sanitary authorities paternal in character. We are prepared, when necessary, to introduce and enforce, and the people are ready to accept, measures which might seem radical and arbitrary if they were not plainly designed for the public good, and evidently beneficial in their effects. Even among the most ignorant of our foreign-born population few or no indications of opposition or resentment are exhibited to the exercise of arbitrary power in sanitary matters. The public press will approve, the people are prepared to support, and the Courts sustain, any intelligent procedures which are evidently directed to the preservation of the public health. The belief is never

aroused in any class of the population, however ignorant, that the institution or enforcement of any sanitary measure is primarily designed for the restriction of individual freedom. There is nowhere to be found any jealousy or distrust of law or government, as such. It is, therefore, possible to adopt measures more arbitrary in many respects than could be adopted in most other countries, simply because our Government is democratic.

"This gives the keynote to the attitude of the sanitary authorities of New York. The most autocratic powers, capable of the broadest construction, are given to them under the law. . . . The conduct of sanitary matters in New York is restrained by no traditions or precedents."

It seems to me that if such a pronouncement is needed in order to commend to a nation such as ours the adoption of a practice hitherto so restricted in its operations as that which applies to New York City, we have yet much to do in this country in the way of educating the people on democratic lines to the willing acceptance of autocratic measures. Only then can we induce them to assent to the infinitely more stringent regulations which any English authority could impose if phthisis were placed on the same statutory footing as the acute infectious diseases specified in our law as to compulsory notification.

And now let us see how the demands which have been made as to this would be likely to operate if the statutory approval required by the Infectious Disease (Notification) Act were granted.

We will assume the practice to be in operation, and that notifications of phthisis in its early stages take place amongst some of the hundreds of thousands of young men and young women who work in large houses of business, and who, besides, are obliged to share their sleeping accommodation with others either in those houses of business or elsewhere. In the first place, they must be visited. But by whom? Some may answer, "By the Medical Officer of Health." But every such officer knows that even as regards the infectious diseases that are now notifiable this has already become quite impracticable, not only in large

centres of population, but still more so in those combined sanitary areas where medical officers of health have charge of eight, ten or twelve separate sanitary districts spread over areas at times as large as counties. The consequence is that even now this work has to be largely carried out by the sanitary inspectors; but I am certain that if this duty were so relegated as regards such classes as I refer to, very great friction would arise, even if the inspectors acted under some general supervision of the Medical Officer of Health. Whether, however, the visit of inspection be paid by one or another officer, it will necessarily have to take cognizance of both the home and the place of occupation of the phthisical person; and the action taken, whether by leaflets or by personal advice, cannot fail to become known to fellow-employés, and in many cases to employers also. The justification for the demand that phthisis shall be compulsorily notified lies in the fact that the person in question is suffering from a dangerous infectious disorder communicable from person to person. Hence the question is already arising whether it is right to allow such a person to be in constant association with hitherto healthy people by day and still more so by night; and it is quite certain that the need for adopting special precautions as to sputa, etc., would lead to a large number of such persons being quietly dismissed from their posts. If such persons found fresh employment, they would certainly take care not again to afford any outward evidence of their malady by the adoption of the precautions urged on them in the interests of the public; and it is equally certain that they would to the utmost avoid consulting another medical practitioner, because their disease would again be notified, and precisely the same consequences that followed on the first notification might again be brought about.

Without following out such cases as these for several years, and to the bitter end, it will suffice for me to say that, in my opinion, a large amount of harm would result if phthisis were included in the list of notifiable diseases under the English Act. The certain knowledge that notification and the intervention of public officers would ensue would prevent resort to medical advice in the early stages of the disease, when its progress can best be arrested. The loss of employment consequent on

notification would often tend both physically and mentally to deprive the ailing persons of their best if not their only chance of cure or improvement; for there are few diseases the cure of which is more dependent than is the case in incipient phthisis on good food, wholesome surroundings, and freedom from mental anxiety. Indeed, it is of the first importance to a vast number of persons so suffering that they should be able continuously and without hindrance to follow an occupation sufficiently remunerative to keep them from any approach to physical want or anxiety of mind. Is this result likely to be brought about by the compulsory notification of phthisis? I believe it is not.

But objection may be raised to my line of argument. In the first place, it may be said that I have chosen by way of type a class of cases which presents exceptional difficulties. I am free to admit that this is, in some respects, true. But, on the other hand, you would hardly expect that, when I was setting out the difficulties which would, in my opinion, follow on the addition of phthisis to the list of diseases to be compulsorily notified, I should try to exemplify my point by reference to cases which were most free from such difficulties. My point is to emphasize the difficulties and the mischief that might result from such notification, and cases such as, or in every essential respect comparable to, those to which I have referred would soon come to be counted by their thousands.

Or, again, it may be objected that even if all that I anticipate should come to be true, the hitherto healthy are entitled to be protected from those whose health and whose prospects of life are already to some extent compromised. My answer is, that I believe that the attempt on the part of phthisical persons to avoid notification would in itself do a great amount of harm, not only to the individuals already suffering, but to the healthy with whom they are in hourly and daily association. The English law as to the compulsory notification of infectious diseases was never intended to bring under a system of public sanitary supervision even a single individual who during a long series of years would have to follow his or her usual avocation. This supervision might in a majority of cases be carried out with every discretion

and every effort to avoid publicity; but if it were carried out under our present system of sanitary organization, and under our present law, it could not but run the risk of leading to hardship beyond that which the public have a right to expect others to suffer on their behalf, and indirectly this would in the end defeat the primary object held in view.

I am glad to know that I by no means stand alone in entertaining this view. A Special Commission was appointed some time since by the Académie de Médecine in Paris to study the question of the prophylaxis of tuberculosis. This Commission was composed of a number of the most eminent physicians in France. They submitted their report in May of this year, and the Académie adopted it, together with a series of resolutions. The report lays special stress on the danger which the phthisical patient involves to the public, especially by reason of the infective sputa, and it makes a series of recommendations, some of which affect the phthisical person. The proposal that the disease shall be made the subject of compulsory notification is then discussed at length, and two principal reasons, in addition to others, are given against the proposal. The first sets out the consideration that the moral effect of divulging by means of an official declaration that which is in effect a medical secret would be harmful. It recalls the fact that phthisis is not a disease that can be classed with infections such as diphtheria or small-pox; but that, in the estimation of the public at least, it has a hereditary as well as an infectious aspect, and as such it is a disease the incidence of which should not be noised about beyond the family circle. In brief, it is held that the public would not accept such a legal enactment without protest and resistance ("sans protester et sans se défendre"). The grounds on which this conclusion was arrived at may, in some respects, have more force in France than in this country.

The second reason is deemed to be the more important. It is that, in a family unwilling to adopt the needed precautions, it would be impracticable to impose any restrictions, applying as they would to a disease that would necessitate an almost continuous intervention on the part of the sanitary officers for

months, and even for years. One alternative alone is deemed sufficient to meet such cases, namely, consignment of the sick person to a hospital, and this, it is explained, is the actual practice followed in Norway.

The final conclusion of the French Commission as regards the compulsory notification of this disease is: "It must not be dreamt of—at least for the present" ("Il n'y faut donc pas songer, au moins actuellement"); a conclusion which has the more importance for us when we remember that, owing to a marked difference between the habits of our Continental neighbours and ourselves in the matter of danger arising from the disposal of sputa, the need for control is greater amongst them than it is in this country. The following are the actual terms of that portion of the report which sets out these two reasons:

"La première, qui confine au secret médical, vise l'effet moral produit sur le malade, sur sa famille, sur les habitants d'une petite ville, par la déclaration officielle d'un cas de tuberculose. Cet effet, a-t-on pensé, serait déplorable, et tel que peu de médecins oseraient braver la réprobation que soulèverait l'accomplissement de ce devoir. C'est que la tuberculose n'est pas, comme la diphtérie ou la variole, une maladie de hasard ou de pure contagion. La tuberculose, quelque contagieuse qu'elle soit, est aussi une maladie héréditaire, beaucoup plus héréditaire encore que contagieuse, dans l'opinion commune; et les familles où elle fait des victimes cachent soigneusement cette plaie, cette tare qu'elles voudraient se cacher à elles-mêmes.

"Elles n'accepteraient donc pas sans protester et sans se défendre —en changeant au besoin de médecin—la divulgation de leurs misères pathologiques. Car, si conformément à la logique et au texte de la future loi sanitaire, les visites sanitaires suivent la déclaration, celle-ci, quelque secrète qu'elle soit de par la loi qui exige du maire ou du secrétaire de la mairie la discrétion absolue, sera bientôt connue de tous.

"La seconde raison, meilleure encore, c'est l'impossibilité matérielle de faire une prophylaxie utile dans une famille récalcitrante. Ce n'est pas, en effet, d'une ou deux interventions qu'il s'agit ici, mais de l'intervention presque continue pendant des mois et des

années, du bureau sanitaire. En effet, la tuberculose dure longtemps, et les dangers de sa contagion se renouvellent chaque jour, à chaque instant, à chaque crachat. Le seul moyen logique et efficace contre le tuberculeux qui ne peut ou ne veut détruire ses crachats ou ses suppurations bacillifères, c'est *l'internement dans un hôpital.* Les Drs. Holmboe et Nanssen, chargés de rédiger, pour la Norvège, un projet de loi contre la tuberculose, n'ont pas hésité. Voici le 2e paragraphe de l'article VI. de leur projet: 'Dans le cas où la situation du malade ne lui permettrait pas de prendre les mesures nécessaires, ou que le malade, par suite de mauvaise volonté, aurait négligé de suivre les injonctions de l'autorité médicale, celle-ci est autorisée à ordonner le transport immédiat dans un hôpital.'"

I will quote one other opinion in the same direction, coming as it does from one who would hardly fail to look at the matter from the point of view of curative medicine, as well as from that of preventive medicine. Sir William Broadbent, in a recent lecture on "The Prevention of Consumption and other Forms of Tuberculosis,"* lays it down that "prevention of the spread of consumption from persons suffering from the disease practically resolves itself into the destruction of the sputa." This, as you know, is the main danger, which it is hoped to avoid by a system of compulsory notification. But what is his view on that point? It is as follows: "Some of my zealous friends advocate notification of consumption, as is done in cases of fever, but, I ask, what are you going to do with the patients when you have notified them? . . . I doubt whether any effectual inspection and enforcement of precautions would be practicable. The worry would be intolerable."

That, as you will have gathered, has been the opinion which I have held for several years past, and which has thus far governed such advice as I have been called on to render.

But do not imagine that I am callous to the fact that in England and Wales alone considerably over 40,000 deaths are still registered every year as due to phthisis, the form of tubercular disease

* *Lancet,* October 29, 1898.

which is so especially identified with an aerially-conveyed infection, and with which dried sputa may reasonably be held to have important concern. That is not my attitude. Neither is it the case that the French Commission would leave the matter where it is. Indeed, another of their conclusions supplies me with the link between that which I feel it my duty to oppose and that which I earnestly desire to see brought about. The Académie de Médecine announce that in the struggle against tuberculosis reform is called for, but that it lies rather with those who teach than with those who are concerned with administrative measures, and that, above all, it is to the physician that we must look to take the lead in the necessary contest against this infection: "La lutte contre la tuberculose dans la famille, relève du MÉDECIN." And again, when asking who can best secure the observance of the necessary precautions, the report says: "Qui peut les imposer, sinon le médecin?"

For us in this country it is important to remember that all our sanitary legislation has been based on antecedent education, whether this has been acquired as the result of bitter experience or by repeated teaching and example. And it has been wisely held that whilst our legislative and administrative measures should always be just so far in advance of public opinion as to draw that opinion further along the path of progress, it is most necessary to avoid so great or so hurried an advance as may tend to alienate the public and thus to lead to resentment, and even resistance.

During the last few years scientific research has indicated how the phthisical patient himself becomes a danger, and the physician engaged in the practice of curative medicine has joined those who, carrying on the work of preventive medicine, have for many years waged so successful a contest against pulmonary tuberculosis. To the former the so-called "crusade" against tuberculosis is new; but happily he joins it just at the moment when his influence in promoting the necessary education for the further control of this disease is likely to be of overwhelming importance.

His advice is sought by the phthisical person, and counsel which is sought is generally followed. There are also many who

would be careless, even indifferent, to precautions which they might be urged to adopt in the interests of the public, but who, when told by their physician that unless they adopt one and another simple precaution they will necessarily diffuse a fatal infection within their own homes and to their immediate relations, would readily do all that they were bidden by way of precaution And when once the adoption of precautions had become the habit at home, they would equally be carried out elsewhere. It is, therefore, to the advice given by those who practise the curative branches of medical science, whether in hospitals or in private, that we must so largely look for the first steps towards progress in this matter. The action of the physician with regard to the individual patient, coupled with that of the medical officer of health in diffusing knowledge as to the causes of tuberculosis amongst the public generally, will, in my opinion, be more akin to the measures which have been adopted in New York than that of making phthisis a notifiable disease under the English law. Already a number of excellent codes of advice and of rules as to this have been laid down, by the medical staffs of certain hospitals for the treatment of phthisis, by certain medical officers of health who have induced the sanitary authorities to distribute them in the form of leaflets, and by certain associations.*

Whilst discussing the question of the notification of phthisis, I would recall the fact that before any infectious diseases were made notifiable under statute, certain sanitary authorities had arranged to pay fees for a voluntary notification of some of the infectious maladies, and that the results of this action went in large measure to educate the public to the need for embodying the necessary requirement in a general statute. This precedent seems to me to be worthy of imitation for the purposes of phthisis; indeed, such a method of notification would more nearly resemble the system in New York, to which reference has recently been so often made, than would be the case if phthisis were placed on the same foot-

* Amongst these may be mentioned the rules laid down by the Hospital for Consumption at Brompton, S.W.; by the Victoria Hospital for Consumption, Edinburgh; by the Medical Officers of Health of Birmingham and Glasgow; by the National Association for the Prevention of Consumption and Other Forms of Tuberculosis; and by the National Health Society.

ing as those acute infectious diseases which now find a place in our English Act as to compulsory notification.

I can also see great advantage in the construction, for public health purposes, of isolation hospitals for phthisical patients. The educational effect of even a temporary residence in such an institution, where the adoption of precautions against the diffusion of the tubercular infection would form a rule of life, would in my opinion be very great. Such institutions would also have other advantages. They would provide the conditions favourable to the complete cure of persons suffering from incipient phthisis, and who, if left to themselves, would ultimately succumb, leaving those dependent on them to be a burden on the public rates; and they would further serve to provide, in separate buildings, for those who, whilst suffering from the more advanced forms of the disease, could not fail to act as diffusers of the infection around them and to add to the misery of their own homes.

Three administrative measures, therefore, deserve attention. Firstly, the education of the public by physicians, health authorities and others in the causes of tuberculosis and in the means for preventing its spread. Secondly, the provision of means for the temporary isolation of persons suffering from phthisis in its various stages. And lastly, certain corporate public health authorities might find themselves able to carry out as an experiment a system for the voluntary notification of phthisis, and even of all forms of tuberculosis in their districts.

Since these lectures were delivered great prominence has been given to the question of the prevention and control of tuberculosis by the important gathering which was summoned by His Royal Highness the Prince of Wales, to meet at Marlborough House on the 20th of December, 1898, in connection with the formation of "The National Association for the Prevention of Consumption and Other Forms of Tuberculosis." I had the honour of being amongst His Royal Highness's guests on that occasion, and I was struck with the fact that amongst the speakers there was

absolute unanimity on two points, namely: (1) That the greatest danger which man incurs of receiving the tubercular infection lies in the use of milk from tuberculous cows; and (2) that the best chance of destroying the tubercular infection when once received into the lungs is by treatment in the "open air."

This leads me to recall certain weighty words uttered by the Prince when, in delivering the inaugural address of the Congress of Hygiene, 1891, he dealt with the question of the preventable diseases. "IF PREVENTABLE, WHY NOT PREVENTED?" was the question which His Royal Highness put; and I have no hesitation in saying that few words ever served as a greater stimulus to those engaged in the preventive branches of medicine, both in this and other countries, than those embodied in this question.

The present is eminently an occasion in which to apply the lesson those words convey. The knowledge we now possess as to the striking effects of the "open-air treatment" on pulmonary tuberculosis when it already exists, needs to be applied for the prevention of that disease; for the cost of erecting sanatoria in sufficient numbers for the cure of tubercular consumption so long as we allow a principal cause of tuberculosis to remain in operation would, in itself, largely defeat the object which is aimed at. It is, therefore, absolutely necessary that the public should be aroused to the danger of confining milch-cows, whose place in Nature lies in the *open air* of our pastures, in the small amount of air-space now allotted to many thousands of those animals in cowsheds and byres, some of which they never leave for the whole period during which they are supplying milk for human beings.

THE END.

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